

FEDERATION OF MALAYA

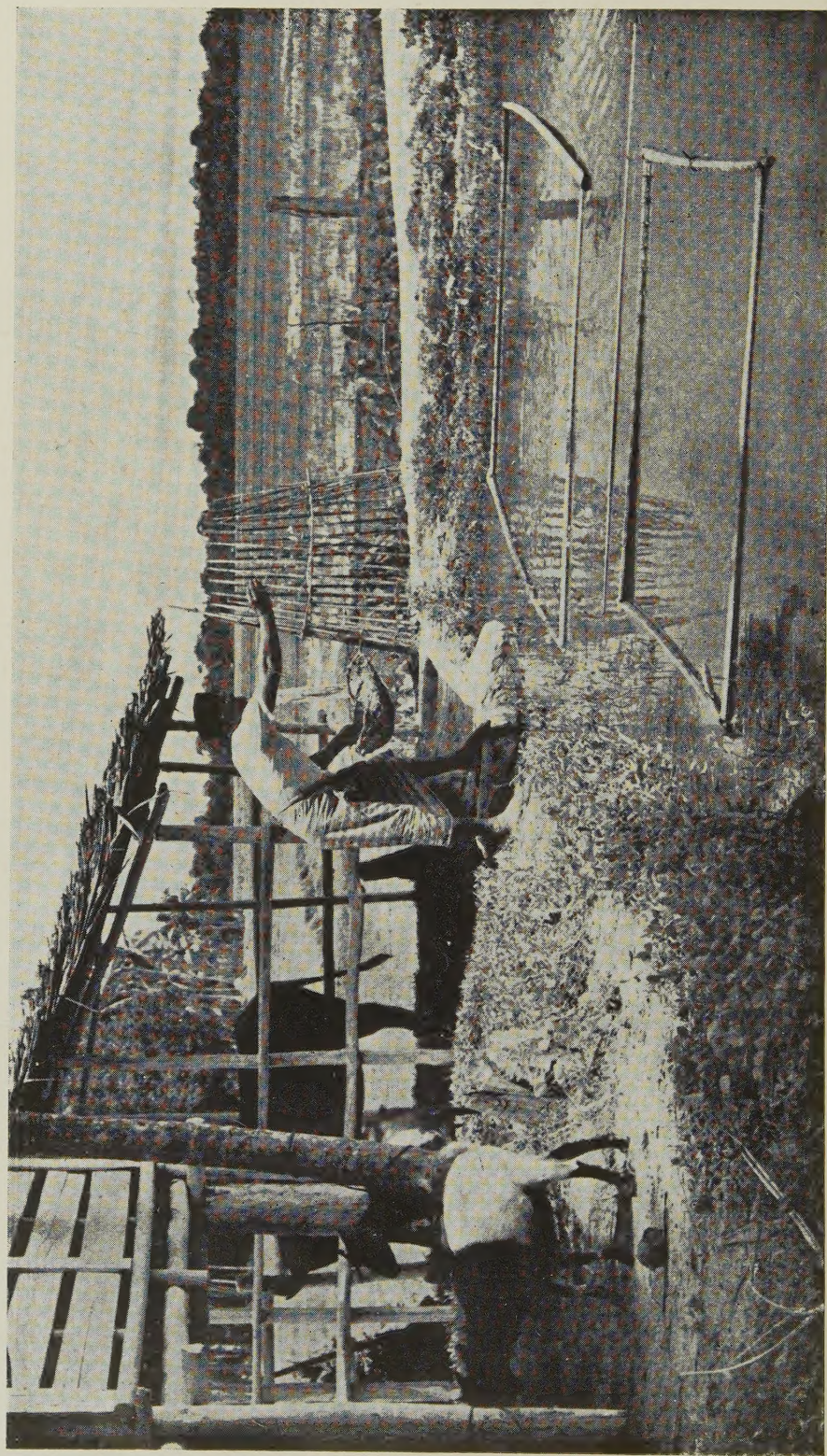
Annual Report
of the
DEPARTMENT OF AGRICULTURE
for the year
1952

BY
O. J. VOELCKER, C.B.E.,
Director of Agriculture, Federation of Malaya

KUALA LUMPUR:
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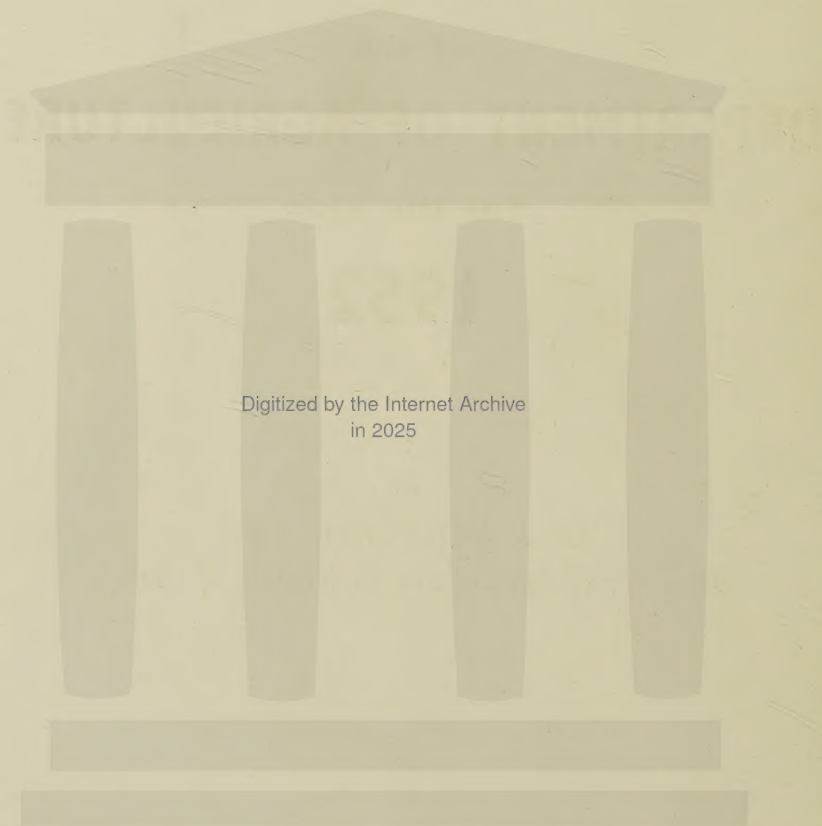
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REPORT OF THE

Annual Report



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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, FEDERATION OF MALAYA, FOR THE YEAR 1952

SECTION I

POLICY

The agricultural policy of the Federation of Malaya Government has remained unaltered from that recorded in the last Report of the Department of Agriculture. Within this general policy emphasis during 1952 has been laid on the development and expansion of three of Malaya's agricultural activities—rice production, smallholders rubber replanting, and pig and vegetable production associated with the new villages.

2. Other aspects of Government's agricultural policy have by no means been neglected by the Department, but as long as the severe restrictions imposed by the shortage of staff and other resources exist so must the development of these other lines of work be curtailed. For example, only limited progress has been made during the year in the diversification of Malayan agriculture, the improvement of small livestock and the solution of soil fertility problems.

RICE

3. Although it has been for many years Government's policy to increase the production of locally grown padi, difficulties in importing adequate quantities of rice during 1952 accentuated the need for doing everything practicable to implement this policy.

PRICE OF PADI

4. The first step taken was to increase the minimum price paid by Government for locally grown padi. The price ruling up to August, 1952, was \$15 a picul delivered at Government mills and this price was increased thereafter to \$17 a picul.

FERTILISER SUBSIDY

5. The second step taken was to introduce a fertiliser subsidy for the padi areas of Kelantan and Trengganu, where Departmental trials and demonstration plots had proved appreciable increases in padi yields as a result of the use of a specific fertiliser mixture. It was apparent in the early stages of preparing the land for the 1952-53 crop that the *raayat* was unable or unwilling to pay the full price of the fertiliser, and Government therefore granted a subsidy of half the cost. The *raayat* reacted enthusiastically and some 210 tons of the mixture—as much as could be handled at that time—were sold.

6. But padi fertiliser policy will be left fluid. The amount of subsidy, the length of time over which it may be paid, and the padi areas in which it may be granted are matters which cannot at the moment be crystallized into a fixed and definite policy.

THE RICE PRODUCTION COMMITTEE

7. The third step taken was to appoint a Committee in November, 1952, to consider ways and means whereby the acreage planted under padi in the Federation and the yield per acre could be materially increased within the next three years. The report of the Committee is not expected to be published until 1953.

SMALLHOLDERS' RUBBER REPLANTING

8. Details of the scheme evolved by the Rubber Producers (Replanting) Board for the replanting of rubber smallholdings will be found elsewhere in this Report. It will be noted that the Department of Agriculture retains responsibility for providing approved rubber planting material, though the funds for this are to be granted from the Replanting Cess.

9. The greatly increased acreages of clonal seedling nurseries will make heavy demands on the time of the Department's staff in the States and Settlements, but the Department must not divorce itself from playing its part in smallholders' rubber replanting which is one of the most important agricultural problems facing the Federation.

AGRICULTURE IN NEW VILLAGES

10. During 1952 the policy of allocating funds for developing agriculture in new villages was continued. A sum totalling \$465,663 was spent. Although exact figures for production are not available the quantity of vegetables and pigs from new village farm lands greatly increased during the year.

LAND ADVISORY COMMITTEE

11. This Committee was appointed in March, 1952, with terms of reference which include the issue of advice on the best use of the land and water resources of the Federation. The conclusions of this Committee, when reached, will have a profound effect on the future development of agriculture in Malaya. Errors of land utilisation in the past are all too obvious to-day. A clear statement of policy on the development of unalienated land will go far in avoiding future mistakes.

REORGANISATION OF THE DEPARTMENT

12. The reorganisation of the Department became effective on the 1st January, 1952. The essential feature in the reorganisation was the creation of an Agronomy Branch, the main function of which is to conduct field experiments formerly undertaken by either the Field or the Research Branches. The increase in the number of Federal Experiment Stations and the absolute necessity for continuity in the conduct of field experiments made this reorganisation advisable.

STAFF

13. The Senior Staff Establishment was only half filled during 1952. Recruitment prospects have, however, improved greatly. The Junior Staff Establishment, which includes the all-important Agricultural Assistant posts, remained unfilled. In every aspect of its work the Department has been handicapped during the year through staff shortage.

14. It is with great regret that I have to record the murder by terrorists of Mr. Chuah Eng Chan, Agricultural Assistant, Pahang, in October, 1952.

SECTION II

AGRICULTURE IN THE FEDERATION OF MALAYA

A.—WEATHER

15. All parts of the Federation report unusual features in the weather of 1952. Except for some floods in the first quarter in Johore and Malacca the rainfall generally was below average, in particular during the normally wet months of November and December. On the coast of Selangor drought conditions existed and some rainfall-dependent padi areas were not planted.

B.—CROP REPORTS

(i) RUBBER

16. Comparative acreages under rubber in the Federation are as follows:

Calendar Year.	Estates. Acres.	Smallholdings. Acres.	Total. Acres.
1948 ...	1,952,347	1,410,178	3,362,525
1949 ...	1,970,579	1,393,881	3,364,460
1950 ...	1,964,370	1,393,881	3,358,251
1951 ...	1,963,735	1,571,486	3,535,221
1952 ...	1,996,727	1,616,093	3,612,820

17. Production figures are given in the following table:

PRODUCTION (IN TONS)

Calendar Year.	Estates.	Smallholdings.	Total.
1948 ...	402,907	294,071	696,978
1949 ...	400,009	270,248	670,257
1950 ...	375,853	316,732	692,585
1951 ...	327,956	275,924	603,880
1952 ...	338,328	244,318	582,646

18. Pan-Malayan imports and exports of rubber during the same periods were:

PAN-MALAYAN IMPORTS AND EXPORTS (IN TONS)

Calendar Year.	Gross Exports.	Gross Imports.	Net Exports.
1948 ...	979,115	300,471	678,644
1949 ...	899,212	220,141	679,071
1950 ...	1,106,500	448,655	657,845
1951 ...	1,155,277	547,107	608,170
1952 ...	910,420	338,855	571,565

19. The price of rubber fell sharply in February from \$1.40 to \$1.08 per lb. for No. 1 R.S.S. smoked sheet. Thereafter the price fell slowly to 75 cents in September, after which it rose, reaching 90 cents per lb. in December.

20. The fall in price at the beginning of the year was received with considerable fortitude by all sections of the rubber industry, but it should perhaps be recorded that the lowest prices of 1952 were considerably higher than those prevailing between the end of the war and the first sharp rise that occurred in 1950. During that period the price for No. 1 R.S.S. varied from 35 to 50 cents per lb. The cost of labour and materials, however, remained at much higher levels during 1952 than those pertaining before 1950.

21. Estate production rose slightly compared with the previous year and there was a decline in smallholders' total production. It is probable that smallholders' production was only slightly influenced by the fall in prices since yields could be expected to decline as a result both of the intensive tapping practised during the previous 20 months and of the advancing age of trees already past their prime. Smallholders' replantings and new plantings since the end of the war are not yet of a sufficient age to make good this fall in production.

22. Average yields of rubber in lbs. per acre in recent years are 419 for estates and 443 for smallholdings. The lower yields for estates can be explained by the considerable area of immature rubber and the more conservative tapping policy adopted by most estates.

23. Throughout the Federation estates are pursuing in the main a steady programme of replanting. Generally, old rubber is being replaced with new rubber of high potential yield, but there are some examples of rubber being replaced by oil palms; this is a most welcome development in a country that relies so heavily on the fortunes of one economic crop.

24. The year 1952 has seen great activity in the reorganisation of the Malayan rubber industry. The recently created Rubber Producers' Council, representative of both estate owners and smallholders, played an essential part in framing legislation in connection with the cess, to be used for replanting, on the export of rubber. As far as the smallholders were concerned, both Government and the Rubber Producers' Council took advantage of the findings and recommendations of the Rubber Smallholdings Enquiry Committee which issued its final report early in 1952.

25. In March, the Rubber Industry (Replanting) Fund Ordinance was passed by the Legislative Council. The Ordinance provides for the collection of a cess on the export of rubber to provide funds for replanting; the cess collections are divided into two funds: Fund A is for owners of properties of 100 acres or more rubber land, while Fund B is for owners with less than 100 acres.

26. Fund A is administered by representatives of the Rubber Growers' Association, the Malayan Estate Owners' Association and the United Planters Association of Malaya. Owners in Fund A are credited individually with that portion of the cess which corresponds with their certified production, but these credits must be used for replanting or new planting unless, of course, all their land is already under approved high yielding trees in which case their credits are returnable in cash. Expenditure on new or replanting since the 1st January, 1946, qualifies for the use of individual credits.

27. Fund B, which is the residual sum after the monies in Fund A have been deducted from the total cess collected, is administered by a committee comprising representatives of the Rubber Industry (Replanting) Board, smallholders and Government officials. Since accurate figures for production on individual smallholdings are impracticable to obtain, the participants in Fund B do not have an individual specific credit as do those participating in Fund A. Fund B has, therefore, been treated as a common pool for financing smallholders' replanting on smallholdings.

28. The Committee's function has been to organise, finance and administer smallholders replanting throughout the Federation. The organisation, still in its infancy at the close of 1952, will comprise a Chief Executive Replanting Officer, State and Settlement Replanting Officers and appropriate supporting staff. In order that effective use of the monies lying in Fund B might be made as early as possible, it was decided not to await the recruitment of replanting staff but to make grants immediately available to smallholders who had actually felled their old trees and prepared the land for replanting during 1952. This interim scheme—Scheme I—has been made possible through assistance given by the already overburdened staffs of the Administrative Service, Rubber Research Institute and Department of Agriculture.

29. Scheme II, which is to replace Scheme I on the 1st January, 1953, is essentially similar, and participants in Scheme I will automatically pass into Scheme II. A total grant of \$400 an acre will be made available to any smallholder who replants. This sum is to be paid in instalments according to the work done, but deducted from these payments will be the cost of materials supplied or services rendered, e.g. the cost of planting material or the cost of budding. The Federation Government has agreed to make substantial annual contributions towards the cost of the staff of the organisation, but all other expenses—including of course the acreage grant for replanting—will be met from Fund B.

30. The target for replanting smallholdings has been fixed at 500,000 acres over the next six years. Although budwood is in ample supply the much more popular clonal seedlings are inadequate, and it appears inevitable that most of the replanting will have of necessity to be budded. The Department of Agriculture, in co-operation with the Rubber Research Institute, retains responsibility for the supply of approved high yielding planting material, and Colonial Development and Welfare Scheme No. 1176, which financed the production of this material, will terminate in March, 1953.

31. Smallholders showed considerable interest in Scheme I and preliminary grants for the clearing of old rubber trees preparatory to replanting have been approved for 7,084 acres. Replanting prior to the introduction of Scheme I in September, 1952, remained on a very small scale and is estimated not to have exceeded 4,300 acres.

32. Continued interest has, however, been shown in new planting.

33. There has been no marked change in the number of the various types of societies organised for the more rational purchase or processing of latex, or in the volume of the business done. Some new centres for latex collection and processing have been opened and others have been wound up. The Rural and Industrial Development Authority has initiated several schemes for latex collection and processing.

(ii) RICE

34. The 1951-52 padi season was most disappointing; not only was the planted acreage reduced from the previous season but the yields of wet padi per acre showed a marked decline,

falling from 1,876 to 1,550 lbs. padi per acre. While unfavourable weather conditions in the north of the peninsula were undoubtedly the primary cause of reduced production, the industry felt the full brunt of labour shortage brought about by more attractive earnings in other occupations and by recruitment to the armed and civil defence services. This labour shortage has been reflected in the reduced acreages of padi grown in Pahang, Johore and Perak.

35. The following table gives comparative figures for acreages under wet and dry padi together with yields since the 1947-48 season:

Season.	WET PADI.		DRY PADI.		TOTAL PADI.	
	Acreage. (Planted).	Yield. (In Tons).	Acreage. (Planted).	Yield. (In Tons).	Acreage. (Planted).	Yield. (In Tons).
1947-48	802,730	520,808	82,760	23,807	885,490	544,615
1948-49	842,450	467,825	65,620	19,833	908,070	487,658
1949-50	871,470	667,485	59,060	24,425	930,530	691,910
1950-51	828,590	684,668	46,800	18,255	875,390	702,923
1951-52	790,110	525,712	40,940	15,667	831,050	541,379

36. The figures for the Pan-Malayan production of rice in relation to consumption and retained imports for the past five years are as follows:

	1948.	1949.	1950.	1951.	1952.
Retained imports (tons)	449,739	495,029	435,958	498,029	423,007
Production (tons)	343,065	307,180	435,840	442,780	341,020
Consumption (tons)	792,804	802,209	871,798	941,709	764,027
Percentage of production to consumption	43	38	50	47	45

37. The importance of increasing the Federation's production of padi has become of increasing concern owing to the universal shortage of rice throughout the world. The Federation can no longer be certain of importing all the rice required, the disturbed conditions throughout South East Asia having adversely affected production in those territories from which rice is customarily exported.

38. It has therefore been the Federation's policy to endeavour to increase home production of padi both by increasing the yield per acre from existing fields and by opening up, through drainage and irrigation, new areas. While water control on the padi fields is perhaps the most important single factor in increasing yields per acre, much can be done by evolving superior varieties of padi, by the judicious use of fertilisers, by improved cultivation techniques and by the control of pests and diseases.

39. Unfortunately these improvements can only be brought about after many years research, and the Department of Agriculture, which is responsible for this work, lost many records of first importance during the occupation of Malaya by the Japanese. For the most part padi research had to start *de novo* on the liberation of Malaya. Superior varieties of padi are still under experimental test and are not yet available for general distribution; but research on fertilisers has indicated that their application can result in appreciable yield increases in Kelantan and Trengganu. Some 200 tons of fertiliser were distributed in time for the 1952-53 padi crop in these two States at a price subsidised by Government to the extent of half the cost.

40. The preparation by tractor cultivation of padi fields for planting has been shown to be feasible in most of the padi areas in the Federation, but mechanical transplanting, weeding and harvesting of padi still present problems which have not been solved. Tractor ploughing was organised by the Rural and Industrial Development Authority during 1952 for bringing abandoned padi fields back into cultivation, but the area so treated is at present very small.

41. So pressing has been the immediate need to increase padi production in the Federation that a Committee was set up towards the end of the year to advise on action to be taken to this end. The report of this Committee will not, however, be finished till early in 1953.

42. The price offered for padi by Government to growers during 1952 was 11.25 cents per lb. until the beginning of August, and 12.75 cents from then to the end of the year, for padi delivered to the mill, but most of the crop was sold to Chinese millers at prices in excess of this. It must be remembered that a large proportion of the padi grown in the Federation never leaves the farm and is used to support the farmers' dependants.

43. The cost of rice imports has continued at a high level and this constitutes a further potent reason for increasing locally grown supplies.

COST OF RETAINED RICE IMPORTS (Pan-Malayan)

Year.		Tons.		Value in \$
1948	...	449,739	...	184,197,540
1949	...	495,029	...	200,036,762
1950	...	435,958	...	175,585,707
1951	...	498,929	...	218,739,700
1952	...	423,007	...	198,885,798

(iii) OIL PALM

44. There has been little change in the area planted to oil palms. The increase is small in view of the prediction of a year ago that the industry is at the beginning of a period of expansion. But the replanting of old fields is being undertaken on a considerable scale by certain oil palm estates. The trend still exists of replacing old rubber and coconuts on estates on coastal clay with oil palms.

45. The acreages planted with oil palms and the production of oil and kernels are as follows:

Year.		Planted Acreage.		Palm Oil. (In Tons.)		Palm Kernels. (In Tons.)
1948	...	81,777	...	45,257	...	8,471
1949	...	88,552	...	50,561	...	10,459
1950	...	94,361	...	53,171	...	11,437
1951	...	98,016	...	48,274	...	11,771
1952	...	100,182	...	45,095	...	11,248

(iv) COCONUT

46. Three-quarters of the total area of approximately 500,000 acres are in smallholdings. The main concentrations of coconuts are in the coastal areas of the west coast of Malaya which, unlike the conditions found in most other coconut growing

countries, are clay and not the light sandy soils usually associated with coconut growing. In consequence drainage is the most important factor that affects production. Yields vary greatly from 500 lbs. to 1,600 lbs. of copra per acre and in many areas low yields are associated with poor drainage.

47. Production and acreage under coconuts have remained fairly constant during the past three years; no major changes are likely to occur. Some replanting is taking place on a small scale, but nowhere in the Federation are there substantial replantings or new plantings in progress.

48. Local oil mills and soap factories handle most of the production and there are also substantial imports of copra. Malaya is usually a net importer of copra, and surplus production is mainly exported as oil. During the year, Malayan soap factories manufactured 74,747 cwts. of soap.

PRODUCTION (IN TONS)
(Federation of Malaya)

Year.	COPRA.		COCONUT OIL.	COPRA CAKE.
	Estates.	Small- holdings.		
1948	... 19,011*	45,608*	... 51,164	... 37,970
1949	... 36,957	85,980	... 63,698	... 43,300
1950	... 38,612	110,866	... 72,800	... 47,819
1951	... 39,422	120,620	... 86,397	... 55,661
1952	... 39,523	114,842	... 81,185	... 51,581

NET EXPORTS
(Pan-Malayan)

Year.	COPRA.		COCONUT OIL.	
	Tons.	Value. \$	Tons.	Value. \$
1948	... 28,624†	14,018,419†	... 45,245	45,531,182
1949	... 24,424†	7,159,041†	... 60,504	54,521,306
1950	... 4,778	14,902,910	... 56,045	60,747,279
1951	... 10,878†	6,605,527	... 68,139	87,508,297
1952	... 27,821†	4,501,280†	... 65,113	53,965,806

(v) PINEAPPLE

49. Of the 24,800 acres of pineapple, 16,000 are in Johore and 3,800 in Selangor. There has been little new planting and the published figures show an increase of only 375 acres above the 1951 figures.

50. In Johore, 6,000 of the 16,000 acres are in smallholdings, and out of the total area 12,000 acres are in bearing. "Packers" estate yields increased during the year largely due to improved drainage. For the first time the crop from the "packers" estates was greater than that from smallholdings. In Selangor, only 400 acres are owned by the packers.

51. The post-war development of pineapple has been confined to the peat and muck soils of which there are very large virgin areas in both Johore and Selangor. But these large areas have first to be drained; this has proved impracticable during 1952

* July-December only.

† Net imports.

owing not only to the priority given to schemes for improving the drainage and irrigation of existing or potential padi lands but also to lack of security from terrorist activities. Immediate expansion of the pineapple industry must therefore rely on increasing the yield per acre of planted areas rather than bringing new land under cultivation.

52. The Department of Agriculture at its newly established pineapple stations in Johore and Selangor is obtaining the information required to increase the yield of pineapples. The initial results obtained from these stations and from experiments conducted on the pineapple estates themselves show considerable promise, and improved cultivation techniques are beginning to be adopted by the growers.

53. Small grower production in Johore—almost entirely a Chinese enterprise—has inevitably suffered through emergency resettlement of the people. Nevertheless prices, which ranged from 3 cents to 5.4 cents per lb. depending on quality, for fresh pines sold to the packers remained attractive.

54. The Pineapple Industry Ordinance, 1951, came into effect in 1952. Parallel legislation was passed in the Colony of Singapore. The legislation provides for the levying of a cess on the export of canned pineapples to provide funds for the improvement of the industry. The Johore Pineapple Station and the pineapple investigations on the Selangor station are financed from cess funds.

55. The following table shows the exports of canned pineapple from Malaya since 1948:

EXPORTS				
Year.		Tons.		Value. \$
1948	...	4,099	...	3,652,621
1949	...	8,137	...	6,307,169
1950	...	14,671	...	12,203,911
1951	...	16,913	...	16,884,112
1952	...	11,781	...	12,564,131

(vi) CACAO

56. Experiments have continued during the year to ascertain the best way of establishing this crop and to build up supplies of superior planting material. It is already obvious that cacao cannot be satisfactorily established on the poorer soils of the Federation, such as support average rubber, unless lavish and probably uneconomical dressings of manure are given. There are also strong indications that cacao will not thrive when grown through rubber. On the other hand cacao is growing very well indeed on certain of the richer soils; if this new crop is to become of economic importance expansion must take place on such soils. Fortunately there are thought to be considerable areas in the eastern States of the Federation where successful development may take place, but these areas, still under primaeval jungle, are characterised by poor communications, a sparse population, and are susceptible to terrorist interference.

57. Considerable progress has been made in multiplying planting material of the West African Amelonado variety of cacao both on Department of Agriculture stations and on a few estates.

This variety, which comes true to seed and is readily marketable, was used to establish seed gardens in most States during 1952, and it is hoped to complete these seed gardens in the near future.

58. Certain varieties of cacao of higher quality than West African Amelonado are under trial on Departmental stations, but there are technical reasons why the provision of adequate supplies of planting material from these will take longer than for Amelonado.

(vii) TEA

59. There have been no new developments in the tea industry. Work has continued on Blister Blight disease which made its first appearance in Malaya in 1950. The incidence of the disease has not been so severe as feared at first. It is now known that lowland tea is most unlikely to suffer serious damage as temperatures in the plains are too high. In the highlands, attacks are seasonal, and experiments on both spraying and time and method of pruning indicate that the disease can be kept under control.

60. Production figures are as follows:

MADE-TEA					
Year.	Production.		Exports.		Sold locally.
	lbs.		lbs.		lbs.
1948	...	2,257,619	...	641,804	1,447,189
1949*	...	3,233,950	...	1,853,291	1,606,282
1950	...	3,317,930	...	1,660,350	1,610,782
1951	...	3,684,158	...	1,726,786	1,887,018
1952	...	3,785,158	...	1,597,947	2,016,210

61. The following table gives, for 1952, statistics of acreage and production for highland and lowland estates:

	No. of Estates.	Planted area. (Acres.)	Area in produc- tion. (Acres.)	Plantable reserve land. (Acres.)	Production made-tea. (lbs.)
Highland	35	5,310	3,613	3,852	1,594,046
Lowland	11	3,390	2,622	11,245	2,191,112

(viii) FOODCROPS, VEGETABLES AND FRUITS

62. In Malaya foodcrop production, other than padi, can be said to be largely a Chinese industry. Many of the Chinese follow the age-old system of intensive vegetable gardening in conjunction with pig rearing. It is almost true to say that provided there is sufficient water the nature of the soil is of minor importance. The most favoured sites are valleys and swamps, and on such sites high-priced vegetables and water-grown crops are produced. Into this type of area fish ponds fit easily and naturally and high yields of fish can be obtained from the dung-enriched ponds. On the higher lands, usually those on the valley sides, more hardy dry-land crops such as tapioca, gourds and bitter cucumber are grown.

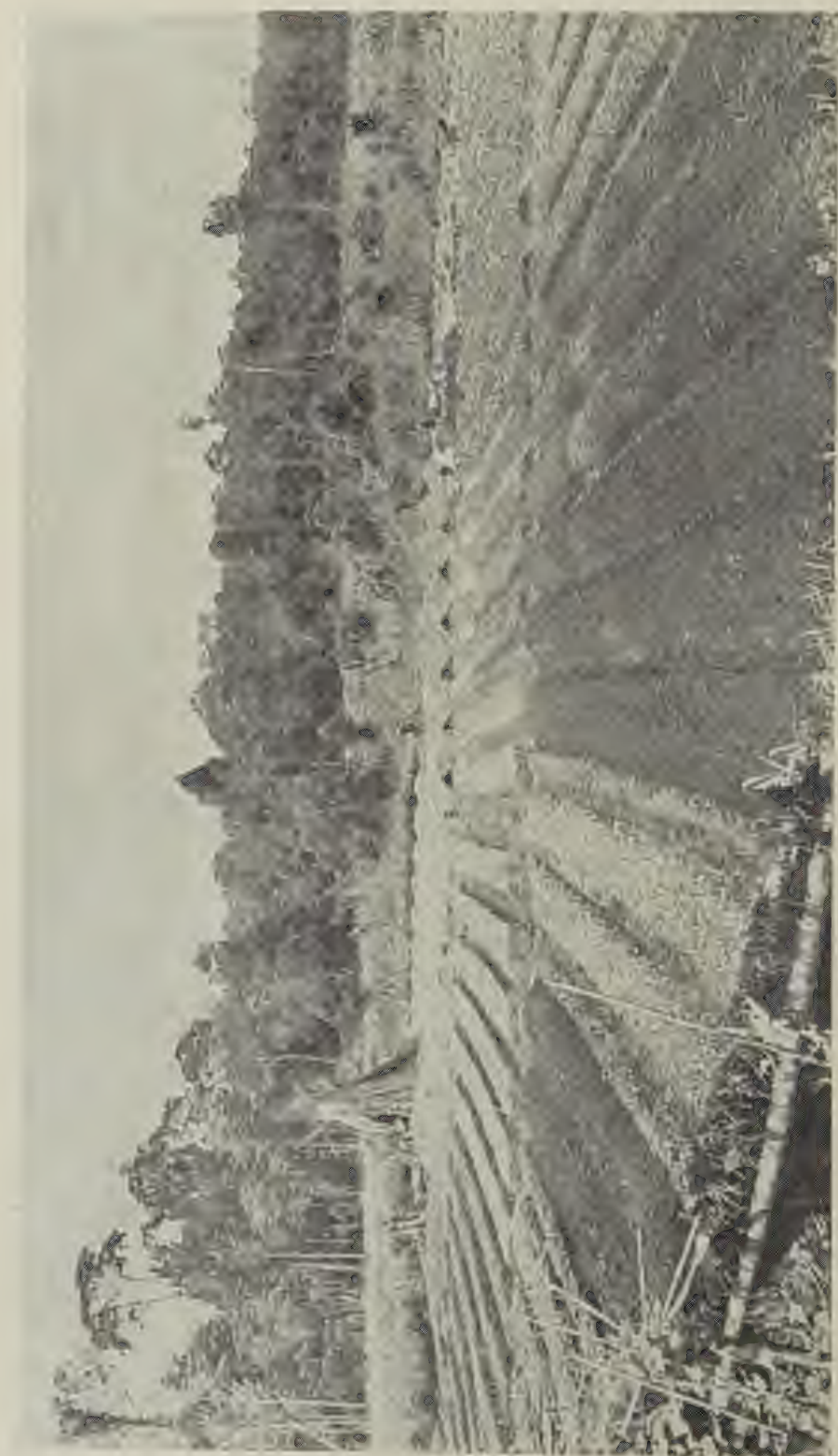
63. The resettlement of Chinese smallholders in new villages disrupted their agriculture, and in 1951 there was a shortage of vegetables, pork and fish. The shortages continued during 1952

* Figures as supplied by estates. The excess of tea sold to tea produced is presumably due to a carry forward of stocks.



WEST AFRICAN AMELONADO CACAO

Seed obtained from the Gold Coast, germinated and grown in the isolation nursery, Pulau Tekong, Singapore, November, 1949. Seedlings transferred to the Federal Experiment Station, Serdang, and planted out March, 1950. These photographs were taken in April, 1953.



New village settlement. Small village settlement. Land covered in 1951. The settlement is in the foreground.

but as the year advanced the situation became much easier. The increase in supplies of vegetables and pigs was made possible in no small measure by the grants of money made by the Government to develop the agricultural activities of the new villages. These grants, totalling \$465,663, were used for the purchase of stud boars, the erection of pig-sties and fencing, drainage and the opening of new land by tractors.

64. The principal fruits of Malaya are rambutan, durian, mangosteen and banana. The Department of Agriculture has made selections of both rambutans and durians and the multiplication for sale of the selected clones constitutes an important function of the State and Settlement Agricultural Stations.

(ix) MANILA HEMP

65. In addition to the Department's field experiments on its own stations and those in co-operation with estates, several estates have established small commercial plantings. Some of these are now in production and good reports have been received on the quality of the fibre. Fibre of only five feet in length, which is considered too short by the old trade standards, has also been well reported on. This may be important because Malaya is not likely to be able to produce fibre equal in length to that of the Philippines.

(x) JUTE

66. Trials continue; the most promising results have been obtained on muck soils in Selangor with the variety Segama.

(xi) COFFEE

67. Although Liberican coffee was an important crop on the clays and muck soils before the advent of rubber, and there is therefore a coffee tradition in the country, there has been little interest shown in expanding this crop in spite of the current high prices. During the last two years prices have been between £390 and £520 per ton.

(xii) SAGO

68. The chief economic value of this crop is in the use of its leaves for the making of attaps for roofing purposes. In addition, pearl sago is produced in small factories and the Chinese use the pith for pig food. It is entirely a smallholders crop.

(xiii) SPICES

69. The main spices grown are chillies, pepper, turmeric and sireh (betel leaf). Production is on a scale sufficient for home consumption only. There has been some increase in the area under pepper, particularly in Johore.

(xiv) TOBACCO

70. Considerable interest in the crop was shown by the Chinese in new villages as it has been a ready method of obtaining quick cash returns. Prices have been high, ranging from \$1.12 to \$3.45 per lb.

(xv) RAMIE

71. Interest in this crop is fading, only small observation plots now survive. Nowhere in Malaya has a satisfactory commercial crop been obtained.

C.—STOCK

(i) CATTLE, BUFFALOES, GOATS AND SHEEP

72. Cattle and buffaloes are important in Kedah, Perlis, Kelantan, Trengganu and Malacca, where they are used for ploughing and cultivating the padi fields. Nowhere in Malaya are they used in any system of mixed farming. The grazing grounds are usually neglected and largely wasted through uncontrolled scrub growth. Sheep are found in the East Coast areas where the climate is more favourable than the more continuously wet western regions. Goats are ubiquitous and much better adapted to Malayan conditions where browsing bushes are plentiful. Fortunately, owing to the Malayan climatic conditions, goats are not likely to cause the devastation for which they have become notorious in the drier countries of the tropics.

73. There is a great unfulfilled need for home produced meat and prices for local supplies are high in comparison with the imported cold storage supplies.

(ii) PIGS

74. After the disruption in production caused by resettlement, pig stocks are getting back to near normal, but there is still some lee-way to be made up. The chief difficulty is believed to be the lack of home-grown feeding stuffs rather than lack of stock. Prices of imported feeding stuffs have been slightly cheaper but all forms of concentrates remain at a high level.

(iii) POULTRY

75. Poultry, both flesh and eggs, are important in the diet of all sections of the community. It is a matter for regret that poultry and egg prices have remained very high and, as with meat, the imported supplies are cheaper than the local products.

SECTION III

THE DEPARTMENT OF AGRICULTURE—
ESTABLISHMENT AND STAFF

A.—ESTABLISHMENT

76. The establishment of the Department is shown in the chart at Table I. The number of posts for senior professional officers was increased from 63 to 70 by the addition of one post of Soils Chemist, two posts of Botanist and four of Agronomist. The staffing position was slightly improved in 1952 due to the recruitment of five officers from United Kingdom, details of this recruitment are given on page 15. In addition, Mr. Gunn Lay Teik, Chemist, who had retired on pension in August, 1951, was re-instated in the service with effect from 1st January, 1952. There were 33 vacant posts at the close of the year made up as follows.

TABLE I
DEPARTMENT OF AGRICULTURE, 1952
Organisation and Establishment by Branches (excluding Clerical and Non-technical Minor Posts)

DIRECTOR.						
DEPUTY DIRECTOR.						
RESEARCH BRANCH.	AGRONOMY BRANCH.	FIELD BRANCH.	PUBLICATIONS BRANCH.	EDUCATION BRANCH.	ADMINISTRATION BRANCH.	MISCELLANEOUS POSTS.
1 Chief Research Officer	1 Senior Agronomist	1 Chief Field Officer	1 Publications Officer	1 Principal, College of Agriculture	1 Administrative Officer	1 Horticultural Officer, Penang
6 Heads of Divisions : Senior Botanist Senior Chemist Senior Soils Chemist Senior Entomologist Senior Plant Pathologist Senior Canning Officer		1 Personal Assistant 6 Senior Agricultural Officers 10 Agricultural Officers 1 Agricultural Economist		2 Senior Lecturers 1 Registrar and Bursar	1 Office Assistant 1 Financial Assistant	
13 Other Senior Officers	14 Other Officers					
5 Senior Officers (<i>Leave Reserve</i>)	4 Senior Officers other than Professional	7 Senior Officers (<i>Leave Reserves</i>)				
1 Assistant Chemist	1 Assistant Statistician					
17 Agricultural Assistant Service Scheme	15 Agricultural Assistant Service Scheme	99 Agricultural Assistant Service Scheme		9 Agricultural Assistant Service Scheme		1 Horticultural Assistant
30 Agricultural Subordinate Service Scheme	24 Agricultural Subordinate Service Scheme	137 Agricultural Subordinate Service Scheme				
9 Miscellaneous Junior Technical Posts	8 Miscellaneous Junior Technical Posts		3 Miscellaneous Junior Technical Posts	2 Miscellaneous Junior Technical Posts		
82 Posts	67 Posts	262 Posts	4 Posts	15 Posts	3 Posts	2 Posts

Senior Agricultural Officer	1
Agricultural Officers or Agronomists ...	16
Senior Lecturers	2
Agricultural Economist	1
Senior Plant Pathologist	1
Senior Chemist	1
Chemists	2
Senior Soils Chemist	1
Soils Chemists	3
Botanists	4
Entomologist	1

B.—SENIOR STAFF CHANGES

(i) BRANCH HEAD POSTS

77. (a) *Head Office (Administration)*.—Mr. R. G. Heath, Chief Field Officer, who had been acting as Deputy Director of Agriculture since the 10th September, 1951, except for the period from the 20th May, 1952, to the 23rd October, 1952, when he acted as Director in the absence on leave of Mr. O. J. Voelcker, was promoted Deputy Director of Agriculture with retrospective effect from the 29th February, 1952.

78. The post of Personal Assistant to Director of Agriculture was abolished and was replaced by that of Administrative Officer. Mr. H. F. Logan, Personal Assistant to Chief Field Officer, who had acted in the former post with effect from 26th March, 1950, was appointed to fill the new post with effect from 1st January, 1952.

79. (b) *Field Branch*.—Mr. J. R. Curry, Senior Agricultural Officer, was promoted Chief Field Officer with effect from the 29th February, 1952.

80. The post of Personal Assistant to Chief Field Officer was rendered vacant on the 1st January, 1952, by the appointment of the substantive holder, Mr. H. F. Logan, to the post of Administrative Officer. Mr. C. Ratnam continued to officiate as Temporary Assistant to the Chief Field Officer.

81. (c) *Research Branch*.—Mr. R. G. H. Wilshaw, Chief Research Officer, remained seconded for full-time Emergency work until his departure on vacation leave on the 12th May, 1952. Following his return from leave on the 14th October, 1952, Mr. R. G. H. Wilshaw was transferred to the post of Chief Registration Officer, Federation of Malaya. Mr. R. B. Jagoe, Senior Botanist, continued to act as Chief Research Officer until the 4th December, 1952, when he proceeded on vacation leave. Mr. L. N. H. Larter, Botanist, was appointed to act as Chief Research Officer with effect from the 5th December, 1952.

82. (d) *Agronomy Branch*.—This Branch was formally constituted on the 1st January, 1952. Mr. E. F. Allen, formerly Senior Agricultural Officer (Research), became Senior Agronomist from that date.

83. (e) *Agricultural Education Branch*.—No changes in senior staff took place during 1952.

84. (f) *Publications Branch*.—This Branch was formerly known as the Economics and Publications Branch. With the re-organisation of the Headquarters of the Department, the post

of Agricultural Economist was transferred to the Field Branch and the post of Assistant to Agricultural Economist was replaced by that of Publications Officer to which Mr. J. J. Holmes, holder of the former post, was appointed with effect from the 1st January, 1952.

(ii) RECRUITMENT

85. The following officers were recruited during the year :

- (1) Mr. I. Watson, B.Sc. (Hons.), was appointed Statistician, Malayan Agricultural Service, with effect from the 3rd April, 1952, and was posted to the Agronomy Branch at Headquarters, Kuala Lumpur.
- (2) Mr. J. S. Ure, B.Sc. (Agr.), D.T.A. (Trin.), was appointed Agricultural Officer, Malayan Agricultural Service, with effect from the 1st August, 1952.
- (3) Mr. P. Class, B.Sc. (Agr.), D.T.A. (Trin.), was appointed Agricultural Officer, Malayan Agricultural Service, with effect from the 1st August, 1952.
- (4) Mr. T. R. Dickinson, B.Sc. (Agr.), D.T.A. (Trin.), was appointed Agricultural Officer, Malayan Agricultural Service, with effect from the 1st August, 1952.
- (5) Mr. A. R. McWalter, B.Sc. (Hons.), was appointed Soils Chemist, Malayan Agricultural Service, with effect from the 29th November, 1952.
- (6) Mr. Gunn Lay Teik, O.B.E., M.A. (Cantab.), was reinstated in the service as Chemist with effect from 1st January, 1952, after having retired from this post on 30th August, 1951, at his own request.

SECTION IV

WORK OF THE DEPARTMENT OF AGRICULTURE

A.—RESEARCH AND INVESTIGATION

1.—PADI (RICE)

(i) BREEDING AND SELECTION

86. (a) *Variety Trials*.—Yield analyses of nine trials which have been in progress for three years have been completed. Four of these trials dealt with varieties still under selection and are being continued in a modified form with the more promising selections. Two selections of Mayang Pasir, M.P. 28 and M.P. 100 have outyielded the standard varieties Sm. 29 by 10 per cent. and M.E. 80 by 15 per cent. over three years at Telok Chengai, Kedah; trials with these two strains are continuing. Of the Anak Didek selections tested at Telok Chengai, there was little to choose between the three best, A.D. 39, A.D. 3 and A.D. 22, but all these were significantly outyielded by Sm. 29 by 8 per cent. Similarly, all five selections of Lembut Pandan were outyielded by M.E. 80 by 12 per cent. and of the five selections L.P. 5 and L.P. 26 gave a slightly but significantly higher yield (3 to 4 per cent.) than L.P. 36.

87. Of 11 introduced Burmese varieties which have been under trial at Telok Chengai for three years all but four have been rejected on account of either poor yield or weak straw. Of these four, so far, D. 34/11 has outyielded the three others and Mly. B. 401 has given a significantly lower yield than C. 33/8 and E. 34/23; trials are continuing.

88. The only trial comparing established local varieties completed this year was that on light sandy soil at Bachok, Kelantan. Of the four varieties involved, Sm. 29 and Rey. 6, which did not differ, significantly outyielded R.C. 4 and Jintan Pasir by 100 to 150 lbs. per acre. While Rey. 6 appears to be capable of the highest yield in favourable years, results with Sm. 29 are likely to be more consistent.

89. New trials commencing this year are concerned mainly with testing new selections in various localities. New trials of unselected varieties are now only being laid down in those areas where such trials have not been carried out previously.

90. (b) *Variety Survey*.—Variety collections are being maintained at Titi Serong, Perak (long-term varieties), Kota Bharu, Kelantan (medium and short-term east coast varieties), Pulau Gadong, Malacca (medium term west coast varieties), and Jelawat, Kelantan (long-term east coast varieties). After additions and discards the number of varieties being grown at each station is—

Titi Serong	...	...	143
Kota Bharu	...	...	308
Pulau Gadong	...	...	400
Jelawat	...	...	47

91. North Kedah varieties are being collected during the present harvest so that a collection may be established at Telok Chengai next season.

92. (c) *Variety Selection*.—The following numbers of lines of varieties under selection are being carried forward,

	1952-53	At
Serendah Kuning	50	Kendong, Ampang Tinggi and Ulu Klawang, Negri Sembilan
Nachin	42	Pulau Gadong, Malacca
Mayang Sa-Batil	60	Genting, Pahang
Radin Ebos	83	Telok Chengai, Kedah
Acheh Puteh	92	Panchang Bedena, Selangor
" "	264	Sungei Burong, Selangor
Siam	75	Pulau Gadong, Malacca
Seraup	99	Titi Serong, Perak
Anak Naga	518	Kota Bharu, Kelantan
Mayang Sa-Gumpal	FS*	Jelawat, Kelantan
Seri Raja	FS	Talang and Simpang Tiga, Perak
Kontor	FS	Bukit Merah, Province Wellesley

93. Final selection trials of 15 Serendah Kuning ear-row selections and mass selection strains have been laid down at Kendong, Ampang Tinggi and Ulu Klawang, and of 24 Nachin selections at Pulau Gadong.

94. Field trials of Serendah Kuning selections at Jasin, Malacca, and Nachin selections at Alor Gajah, Malacca, and Rantau Panjang, Kedah, are also continuing.

* Foundation Stock

95. Multiplication plots of the better Nachin and Serendah Kuning selections have been laid down in Negri Sembilan and Malacca to provide seed for extension trials and general distribution.

96. Seed of Serendah Puteh (Negri Sembilan) and Machang (Perak) are being collected for foundation stocks to be laid down next season for subsequent pure line selection.

97. (d) *Extension Trials*.—The following extension trials have been laid down to test the adaptability of, and popularise potentially heavier yielding varieties.

- (i) Seri Raja South Krian, Perak
- (ii) R.C. 17 Raub/Lipis area of Pahang
- (iii) Rey. 6 and Ser. Kn. 5003 ... Malacca
- (iv) Dummy trial in Kedah to discover technical and administrative difficulties to be followed by a trial of the variety S.S.D. 25 in 1954.

98. (e) *Natural Cross Pollination*.—Pedigree stocks have been replanted with a view to recommencing experimentation at Pulau Gadong in the 1953-54 season.

99. (f) *Hybridization*.—Seed of four *indica* × *japonica* crosses received from Cuttack, India, in connection with the International Rice Commission hybridization scheme have been planted at Pulau Gadong. They promise to be chiefly short-term varieties and all four crosses are showing wide variation due to segregation. Details of every plant (4,500) are being recorded and selections made are to be duplicated at Telok Chengai next season.

100. Forty-four F_2 families of 14 crosses made in 1951 have been planted out at Pulau Gadong. Of these 44 families 25 have proved to be accidental selfs. Of 80 cross pollinations carried out at the end of last year 61 different crosses set seed and 1,250 F_1 plants have been raised.

101. A fairly satisfactory method of emasculation has now been evolved and experiments are continuing on the technique of pollination.

102. (g) *Dates of Sowing Experiments*.—These have been abandoned in Johore (except at Endau) owing to the temporary closure of the test stations in that State. Two experiments in cages at Kota Bharu and Temerloh are continuing, the former to determine effect of time of sowing and maturation period on yield and the latter to select a short-term variety suitable for flood damage avoidance in Pahang.

103. (h) *Quality Tests*.—Laboratory milling tests have been commenced with a Bentall Bench Huller. Results have so far been irregular and it is improbable that this equipment will be effective in distinguishing varieties differing by less than 10 to 15 per cent. breakage. However, there are indications that intra-varietal selections (Nachin) may differ by as much as 20 per cent. breakage. Tests are now continuing to determine what differences exist between samples of the same variety grown in different localities.

(ii) PADI SOILS

104. (a) *Fertility Investigations*.—Three hundred samples of straw and ears from Kelantan, Perak, Province Wellesley and Malacca have been analysed to determine the uptake of major elements in connection with fertiliser trials being undertaken by the Senior Agronomist, to whom the results of analysis have been passed for interpretation.

105. (b) *Nutrient Deficiency*.—A series of experiments with padi to record deficiency symptoms was carried out. The padi was grown in funnel-shaped, glass receptacles filled with sand aggregate. One of the major nutrients or trace elements was excluded in each of the experiments in the series and observations of the appearance of the plants were made from time to time. While some characteristic symptoms developed, growth was too uneven for the observations to be conclusive.

106. The yield of padi in the Padang Kamunting and Kuala Sungei Bharu areas of Malacca has been very disappointing during the past several years. The results of analyses of soil and water samples taken during three visits indicated that a phosphate deficiency in the soil would perhaps be the likely major cause of the failure of the padi. An area has been selected for a manurial experiment to test whether this indication is correct or not.

107. (c) *Toxic Conditions*.—During the previous year a considerable amount of investigation was carried out on the amount of sulphur in “gelam” soils with particular reference to the growing of padi. In this connection, since “gelam” trees are practically the only vegetation to grow on this type of soil, “gelam” stems and roots from several “gelam” areas in the country have been analysed for their sulphur content.

108. During the first quarter of the year 43 further samples of “gelam” timber and roots and 11 samples of other different varieties of timber were examined for their sulphur content. As in the case of samples examined during the previous year, the “gelam” samples from Malacca contained as much as 0.28 per cent. sulphur while timber from another area contained only 0.004 per cent. to 0.050 per cent. sulphur.

109. A quantity of “gelam” soil which had a very strong smell of sulphide and turned black rapidly on exposure to the air on account of its high sulphur content was taken from the Pulau Gadong area of Malacca for a series of pot experiments according to a modification of the Mitscherlich method. The criterion of the test is the ratio of the dry weight of the plant grown on the soil when a specific nutrient was omitted from its fertiliser to the corresponding dry weight produced when this particular nutrient had been adequately added. Thus the actual yield made when any nutrient has been omitted would be due to its “available” amount in the soil.

110. The tests were carried out in two series. In the case of one series the “gelam” soil was limed at the rate of 10 tons per acre and in the remaining series no lime was added. The manurial treatments were N., N.K., N.P.K., and the control. The plants in the unlimed series did not generally appear to thrive well, but in the case of the limed series, the complete fertiliser treatment gave the best results and nitrogen alone was next best. Beginning with these tests, the plants are being analysed to determine the uptake of phosphates, potash and calcium.

(iii) PADI INSECT PESTS

111. (a) *Stem Borers*.—The Tachinid fly *Paratheresia clari-palpis* v.d. Wulp, a parasite of certain species of *Diatraea* which attack sugarcane in the American tropics and sub-tropics, was proved to be capable of breeding in larvæ of both *Proceras polychrysus* (Meyr.) and *Chilo suppressalis* (Walk.) by laboratory investigations carried out in 1951. It was therefore decided to introduce approximately 10,000 of these flies and to release them in a single padi area in the hope that they would become established. The flies were sent as puparia by air from Trinidad where they were bred by the Commonwealth Institute of Biological Control.

112. The first consignment of puparia, numbering 415, arrived in Kuala Lumpur on the 16th April, 1952. Shipments were received at varying intervals over the next six months.

113. Initially it was intended to hold the flies in Kuala Lumpur until they had mated and for about 10 days thereafter to cover the major part of the period of gestation, and then transfer them to the liberation area near Bukit Mertajam in Province Wellesley. This was not satisfactory, however, as the mortality rate after mating was inclined to be high and many flies damaged their wings when kept in confinement and were unsuitable for release, but the greatest mortality occurred during transit of the adult flies from Kuala Lumpur to Bukit Mertajam.

114. The procedure adopted, therefore, was to hold the puparia in Kuala Lumpur until the first few flies emerged and then to transfer the remaining puparia to the scene of operations, sending them by rail. This eliminated transit losses altogether. Liberations were made as soon as about 100 flies had emerged, the releases being made either early in the morning or late in the evening. It was found that liberations made during the day, when the flies were very active, resulted in their immediately darting off so that the sexes were separated and the chances of mating greatly diminished. Early morning and late evening releases, when the flies were sluggish, resulted in the flies congregating on the nearby herbage and on padi leaves, and thus increased the chances of the males finding the females.

115. A total of 8,187 parasites was released between April and the middle of October, but no recoveries have so far been made. Sampling of the area and of surrounding padi areas will be carried out during the next crop period, the first survey probably being made in January.

116. In the course of this work collections of bored padi stems were made from time to time to see whether *Paratheresia* was established in the immediate vicinity of the release point and one interesting record was made regarding the habits of a Tabanid fly, two larvæ of which were found preying on larvæ of *Proceras* inside padi stems. The interest of this discovery lies in the fact that practically nothing is known of the early stages of Malayan Tabanids and this particular habit would appear to be unusual. Published records for other countries indicate that the larvæ of these flies normally inhabit damp soil where they are predatory on other insects. The species concerned has not been identified.

117. (b) *Bugs*.—An outbreak of *Leptocorisa acuta* Thnbg., reported as being severe, occurred on padi in the Kuala Sungei Bharu area of Malacca in March. Examination of samples received showed 13 per cent. of the grain damaged by this insect, which was clearly not, therefore, responsible for the almost total loss of crop. *Leptocorisa* continued to be present in this general area up to May and the maximum damage due to *Leptocorisa* recorded was 26 per cent. on variety Siam 29 and 12 per cent. on variety Nachin 11 growing in the Padi Test Station. Plants which were bagged before flowering showed 0.6 per cent. and 0.3 per cent. *Leptocorisa* damage for these two varieties respectively, but only 14 per cent. of the grain in the bagged plants developed. The corresponding figure for plants which were not bagged was 11.5 per cent.

118. The almost total failure of padi crops in the north-west coastal area of Malacca has been a subject of investigation over a number of years and the bulk of the evidence so far tends to eliminate insects as the primary cause of the trouble. Further investigations are, however, being carried out.

119. (c) *Grasshoppers*.—*Patanga succincta* (L.). An outbreak of this large grasshopper, also known as the Bombay Locust, was reported from Sungei Ruan near Raub, Pahang, on the 28th December. The area affected consisted of some 800 to 1,000 acres, mainly of dry padi on newly cleared land adjoining primary jungle. Other crops present were bananas and ragi *Eleusine coracana*. Only the padi was attacked. Both adults and hoppers were present and covered some 50 to 100 acres.

120. The circumstances of this outbreak conform with those of all previously recorded outbreaks in Malaya, namely a fairly extensive planting of a cereal crop on newly cleared jungle land.

121. (d) *Pests of Stored Rice*.—Very serious damage to flour packed in bleached calico bags was caused by the larvæ of the rice moth *Corcyra cephalonica* St. Infestation arose by invasion from bagged rice stored nearby.

122. A proprietary grain protectant containing piperonyl butoxide and pyrethrins varying from 0.05 to 0.25 per cent. failed to prevent breeding of *Calandra*. Tests included both laboratory experiments on a small scale as well as with 200 lb. bags in a godown.

(iv) PADI DISEASES

123. (a) *Seed Treatment*.—Experiments begun last year were continued. In pot tests, seed treatment with Agrosan GN had no effect on germination or rate of seedling growth. Both treated and untreated seed produced healthy seedlings.

124. (b) *Penyakit Merah*.—Specimens affected by this disease are being obtained from as many different localities as possible with a view to clarifying the position as regards this rather obscure condition. The majority of specimens so far examined have exhibited similar symptoms, including premature yellowing and dying of the outer leaves, stunting of the plants and extensive rotting of the usually poorly developed root system.

2.—OIL PALM

(i) BREEDING AND SELECTION

125. There has been no change of breeding policy, which is concerned mainly with the "dumpy" palms and the development of palms of the tenera type. No breeding of ordinary Deli palms is in progress although some legitimate seed for distribution has been produced.

126. A replicated trial to compare six legitimate tall progenies from three different sources was planted at the Federal Experiment Station, Jerangau, Trengganu, in November.

127. (a) "*Dumpy*" Palm.—Yields of palms in Field 3a and 4 at the Federal Experiment Station, Serdang, Selangor, though not statistically comparable, continue to suggest that the progeny of the dumpy palm E. 206 is appreciably the highest yielding.

MEAN YIELD OF FRUIT BUNCHES PER PALM
(in lbs.)

Year.	Progeny.							
	E. 206		E. 268		E. 152		E. 206.268	
1948	279	..	286	..	178	..	309	..
1949	257	..	197	..	135	..	179	..
1950	230	..	207	..	130	..	145	..
1951	229	..	219	..	163	..	208	..
1952	267	..	218	..	140	..	214	..
Mean.	252	..	225	..	149	..	211	..

Tons of oil per acre estimated at 15% extraction
0.93 .. 0.83 .. 0.55 .. 0.78 .. 0.84

128. The following dumpy planting material was distributed during 1952:

Seed	...	...	...	...	16,949
Germinated seed	...	...	...	...	913
18-month old seedlings	...	...	...	...	457

129. The dumpy progeny trial planted in 1951 on Ulu Bernam Estate, Selangor, suffered some damage by elephants. Two dumpy progeny trials were planted at Highlands Estate, Selangor, in October on a 50-acre site. The planting of dumpy progeny blocks is in progress on six estates. About 120 acres have already been planted.

130. (b) "*Tenera*" and "*Pisifera*" Palms.—*Pisifera* pollen received from Nigeria has been used to pollinate selected dumpy palms. Several bunches are approaching maturity. Two bunches of selfed *pisifera* seed have been harvested and attempts are being made to germinate the seed. A nursery of *Deli* x *pisifera* seedlings has been successfully established at the Federal Experiment Station, Serdang. Arrangements are being made to plant these at the Federal Experiment Station, Jerangau. Ninety *tenera* x *tenera* seedlings received as seed from Nigeria are ready for field planting.

(ii) NUTRIENT STATUS AND SOIL ACIDITY

131. Pot experiments using good jungle soil and liming, started during the previous year, were continued throughout 1952. During the first year, observations of the growth of these palms would seem to confirm the view that oil palm would grow best in acid soils of about pH 4.0. However, during the second half of the current year the palms growing in the soil treated with 10 tons lime per acre started to outgrow the other palms.

132. Analysis of leaf from these palms indicated that while both the calcium and magnesium in the ash had greatly increased in the case of the palms growing in the lime treated soil, there had been no serious corresponding fall in the potash. The nitrogen content of the leaf from the palms of the limed pots was higher than that of the unlimed pots while the phosphate content was lower.

(iii) LEAF ANALYSES

133. This investigation has been continued throughout the year. The previous year's results from the three families E97, E207 and E268 showed that the calcium content of the ash would appear to be directly related to bronzing; on the other hand the potassium content would seem to be inversely related to bronzing. In addition the phosphorus and magnesium contents do not appear to be directly related to bronzing, but the K_2O/P_2O_5 ratio would seem to be directly connected with this condition of the palm.

134. Owing to these interesting results, two additional families E152 and E216 were added to this investigation during the second quarter of the year. The whole area has been divided into five randomized blocks of five plots of eight palms each. Each plot has been further divided into two sub-plots of four palms each. Half the number of sub-plots has continued to receive the standard fertiliser dressing half-yearly and the remaining sub-plots the same amounts of N.P.K. and Mg. but without calcium.

135. Leaf samples have been taken for analyses on four occasions at three-monthly intervals during the year. There would seem to be no significant difference in the results of analyses between the palms of these two manurial treatments. The percentage of the calcium was still higher in the case of the "bronzed" palms of both families E97 and E207.

136. Beginning from September, 1952, in addition to the third frond, samples were also taken from frond No. 17, so that figures would be comparable with those of other investigators.

137. It has also been decided to analyse samples from young palms growing on an estate at Klang. Before planting, these young plants were grown for about one year in a nursery in good soil, so that the full effect of any treatments was not apparent during the first year after planting. Samples will, therefore, be taken beginning with palms of two years of age from the time of planting out in the field.

(iv) ALUMINIUM TOXICITY

138. Two experiments to grow oil palms in a hydroponic solution with excess aluminium indicated that the palms would appear to be able to tolerate as high as a 2 per cent. concentration of aluminium sulphate.

(v) INSECT PESTS OF OIL PALM

139. Damage by the nettle grub *Orthocraspeda trima* Moore was reported during June in Johore. This is an unusual host for this caterpillar.

140. The seeds and young stems of dumpy palms were hollowed out by the ant *Pheidologeton nanus* Roger (or *P. affinis* Jerdon) in North Perak. A dust containing 6.5 per cent. gamma-isomer of BHC applied to the surface of the soil, and as a ring round newly planted seedlings, gave satisfactory control.

141. *Oryctes rhinoceros* L. There have been two reports of serious damage to young oil palm plantings caused by this beetle. Investigation showed that the source of the trouble was decaying rubber wood, both standing stumps and fallen timber, which had been poisoned with sodium arsenite and in which *Oryctes* was breeding profusely.

(vi) OIL PALM DISEASES

142. (a) *Heart Rot*.—Young palms from a nursery on an estate in Johore were attacked by a heart rot in which the base of the central spear was affected with a soft rot giving off a strong, offensive odour. As a result of the rot the central leaves became detached and could be lifted out. The nursery from which diseased plants came had been flooded just before the disease was observed. Healthy seedlings were inoculated with rotten material from affected plants, others were inoculated and kept under flooded conditions and some were kept in flooded soil but not inoculated; in no case were symptoms of the disease reproduced.

143. (b) *Leaf Spot*.—A hitherto unrecorded disease of young oil palm seedlings was reported from an estate in Selangor. Numerous small brown spots were formed on the leaves which dried out and died prematurely, in severe cases causing the death of the plants. A fungus isolated from affected tissue reproduced the disease when inoculated on to healthy seedlings. The fungus has not been observed to produce spores and has not yet been identified.

3.—COCONUT

(i) SELECTION AND BREEDING

144. Shortage of staff still prevents the commencement of breeding but enquiries have been made for ladders and other apparatus for future pollination work. Meanwhile selected parental palms are being preserved.

(ii) INSECT PESTS OF COCONUT

145. *Artona catoxantha* Hamps. An attack by caterpillars of this leaf moth at Ulu Selama, Perak, was reported in May, three months after the outbreak began; 400 palms were attacked. Injury occurred on two estates in Province Wellesley in May and June. The former had an unusually high degree of control by *Apanteles artonae* Rohw., itself attacked by a new parasitic Ichneumon (*Microtoridea* sp.) which was also present on the other coconut estate. *Ptychomyia* gave about 20 per cent. control. The nettle grub *Orthocraspeda trima* Moore damaged about 150 acres at Sungei Bernam, Selangor. BHC from a rotary duster gave good control. The parasite *Pleurotropis parvulus* Ferr. continued to hold the Philippine leaf-beetle (*Promecotheca cumingi* Baly) in Singapore where this pest seems now to be of minor importance.

4.—PINEAPPLE

(i) VARIETY SELECTION

146. A survey of variation in fruit characters at canneries and plantations in Johore, Selangor and Singapore has been carried out during the year. The results from the April to August observations have been analysed and will be combined with those from the December, 1952, to January, 1953, period before a report is issued.

147. The initial selection in the field of a foundation stock of Singapore Spanish pines was completed in July and 1,098 clones and a mass selection plot of 2,826 plants have been planted at the Federal Experiment Station, Jalan Kebun, Selangor. At the same station 603 suckers of the Sarawak variety have also been planted for selection.

148. During November 1,470 suckers of the variety Smooth Cayenne were imported from Australia and these, together with 50 suckers of the same variety from South Africa, have been planted at the Quarantine Station on Pulau Tekong Besar.

(ii) INSECT PESTS OF PINEAPPLE

149. Trials with two formulations of Schradan (Pestox 3H and Tetrax 1) and with the systemic insecticide Hanane were carried out against the mealy-bug *Pseudococcus brevipes* Ckll. on pineapples growing in hydroponic solution. For these initial trials, plants in hydroponic solution were used in order to prevent the mealy-bugs from descending to the roots where they could not be readily observed. The insecticides were added to the hydroponic solution after mealy-bug colonies had been established on the plants. The results were negative in all cases.

150. Initially, the pH of the hydroponic solution was adjusted to a range from 3.4 to 3.75, in which the plants grew well, but it was thought that this range of pH might have had an adverse effect on the insecticide. Further tests were therefore made with the hydroponic solution adjusted to pH 5.8 to 6.2 and subsequently to pH 7.1 to 7.3, but results were still negative.

151. Spraying tests with Schradan (Pestox 3H) also gave negative results.

152. A small scale trial with mealy-bugs established on cut pineapple leaves which were placed in solutions of Schradan and Hanane gave negative results with Schradan (Pestox 3H) and 18.9 per cent. kill with Hanane at a concentration of 1 c.c. per litre and 5.4 per cent. kill at 0.5 c.c. per litre.

153. During these experiments it was found that pineapple plants in nutrient solution held at about pH 7 became unhealthy after about two weeks; the leaves shrank and their margins curled inwards, and there was some loss of turgidity. These symptoms became very marked after three weeks. The pH was then adjusted to 4.5 and recovery commenced within five days and was complete in from 10 to 21 days.

(iii) PINEAPPLE DISEASES

154. (a) *Broken Core*.—In this disease a split occurs in the centre of the fruit, dividing the core transversely. As a result of this the fruit ripens irregularly and has a tapering shape. In addition, affected fruits are liable to be attacked by bacteria

which cause discolouration and rotting. A trial was carried out to discover whether the incidence of the disease is affected by the local practice of removing the crowns of fruits during growth. Incidence of broken core in normal fruits, in which the crown was not removed, was 6.25 per cent. compared with 17.5 per cent. in fruits whose crowns were removed. Decrowning thus appears to increase broken core, although other factors also seem to be involved.

155. (b) *Fruit Collapse*.—Fruits nearing maturity are affected by a soft rot which causes decay of all the tissues. The rot develops quickly and reduces the fruit to a soft pulpy mass within 24 hours of the first symptoms being observed. Externally, affected fruits can be recognised by their dull, dark green colour. Several species of bacteria have been isolated from affected tissues but it is not yet known whether they are primarily responsible for the disease.

156. (c) *Heart Rot*.—The growing point and the basal parts of the central leaves of plants, usually about three to six months old, are affected by a soft, evil-smelling rot. The bud is killed and the whole shoot dies but the rot is restricted to young tissues only and healthy buds may develop from the base of diseased plants.

157. Several species of bacteria were isolated from diseased tissue. One of these, when introduced into the heart of healthy plants, reproduced the disease. Infection occurred only when the tissues of the heart were injured by pricking. It thus appears that heart rot is a bacterial disease, probably soil-borne, which appears when the heart of the plant is injured.

158. (d) *Green Die-back*.—Leaves of affected plants have an abnormally light green colour and are narrower and grow more upright than normal. Successive leaves become smaller so that the plant, as it becomes older, decreases in size. Severely affected plants eventually die. The staff of the Department of Agriculture, Johore, reports that complete recovery occurs when affected plants are sprayed with copper, as a solution of copper sulphate or a suspension of Perenox.

159. (e) *Other Diseases*.—A bacterial soft rot of suckers appearing within six weeks of planting out occurred at the Federal Experiment Station, Jalan Kebun. It was concluded that the trouble could be avoided by ensuring that planting material was not trimmed too drastically and was thoroughly dried before planting out.

160. A leaf spot disease was found to be associated with two species of the fungus *Curvularia*, *C. lunata* and *C. maculans*.

5.—CACAO

(i) AMELONADO

161. The multiplication of the West African Amelonado type of cacao by all possible means has been the major objective of the year. Details of progress made are given below. Almost 10,000 Amelonado cuttings, buddings and seedlings have been distributed. About 2,000 cuttings and seedlings are in stock awaiting distribution and there is an appreciable supply of bud-wood available.

162. The Amelonado seed garden in Field 44 at Federal Experiment Station, Serdang, which was planted in March, 1950, from seed obtained in December, 1949, is now carrying many cherelles. It is hoped that the first sizeable crop will be harvested in March-May, 1953. A total of 147 pods was harvested in 1952.

(ii) TRINITARIO

163. (a) *Clonal Trial of Local Selections*.—The first clonal trial to test certain local Serdang-Cheras type cacao which was planted in November, 1949, yielded 105 pods in 1952. S. 68, which was an early bearing seedling, yielded the most pods (20 pods from 10 cuttings).

164. The second clonal trial of the same material planted in November, 1950, and May, 1951, suffered from heavy attacks by leaf-eating insects. There are a number of casualties which are being replaced but the trial is now making better progress.

165. Clonal observation plots containing eight of the clones have been planted in three areas (Selangor, Pahang and Kedah) but the Pahang plot has been abandoned owing to damage by elephants.

166. (b) *Local Selection Progeny Trial*.—A legitimate progeny trial planted in May, 1951, under tapioca and Gliricidia shade is making fair progress. There have been a number of casualties which cannot be replaced. There are marked differences in vigour of the various progenies.

167. (c) *Imported Trinitario Material*.—Over 2,000 imported Trinitario seedlings at Serdang are being kept under observation. A few are now producing pods. Certain strains appear to be very vigorous.

168. From 35 I.C.S. clonal cuttings imported from Kew only 11 cuttings have survived. These are:

I.C.S.	6	...	...	...	...	1
"	16	...	...	...	...	1
"	39	...	...	...	...	1
"	45	...	...	...	...	1
"	60	...	...	...	...	4
"	95	...	...	...	...	1
"	98	...	...	...	...	2
						—
Total						11
						—

(iii) CRIOLLO

169. From several experiments it appears that local Criollo cacao is less vigorous than Trinitario or Amelonado. The Criollo progeny trial planted under oil palms at Serdang has made little progress in the year and many seedlings have died.

(iv) RECENT INTRODUCTIONS

170. (a) *Upper Amazon*.—Thirty-nine Upper Amazon seedlings were raised from seed from the Gold Coast and passed through the Quarantine Station at Pulau Tekong. The seedlings were planted at Serdang in October and are growing well.

171. (b) *Herrania spp.*—Forty *Herrania* spp. seedlings raised from seed received from the Gold Coast also passed through the Quarantine Station at Pulau Tekong. The seedlings were planted in the Fruit Nursery at Serdang in October and are growing well.

(v) VEGETATIVE PROPAGATION

172. Rotted sawdust has now been adopted as the standard rooting medium in the continuous spray propagator, though it cannot be used more than twice for this purpose, after which it is used as mulch.

173. Hardening bins incorporating a constant overhead spray and an internal spray boom have been brought into use. Results are satisfactory.

174. The routine method used for budding cacao has already been described (Rosenquist. *Malayan Agric. J.* 35, 78). The results continue to be satisfactory but the vigour of the resulting plants seems to vary considerably.

(vi) FERMENTATION

175. The results from earlier fermentation and drying tests showed that the local Serdang-Cheras cacao which was planted in 1934 and 1938 gave very poor pod values and small beans. The number of beans per pod was also very low.

176. Nine Amelonado pods from 24-month old seedlings were fermented and dried in March, 1952. A control of unselected Serdang Trinitario was fermented at the same time. Relative figures obtained were :

	Trinitario (local).	Amelonado.	Commercial standard.
Wt. of 1 dry bean (gms.) ...	0.77	0.82	1.00
Dry beans/lb. ...	589	553	450
Pod value ...	29.6	15.4	12
Recovery (per cent.) ...	25.5	36.2	40

It seems likely that the Amelonado type will give satisfactory results when the trees are older.

177. In this connection the following figures are of interest :

	1st Clonal Trial (local Trinitario).	Amelonado Seed Garden.	Trinitario I.C.S. 1 Seedlings.
No. of pods examined ...	105	91	5
Av. wt. of good wet beans per pod (gms.) ...	55.1	87.3	117
Av. No. of good beans per pod ...	16.4	38.5	40

Even the best local Serdang-type Trinitarios are giving very poor pods in comparison with the imported types. The local type is clearly of little commercial value.

(vii) CACAO INSECT PESTS

178. It has been found that there had been confusion in identification of the chafer *Apogonia* which is now known to comprise *A. cribricollis* Burm. and *A. expeditionis* Rits.; both species were formerly grouped together under the former name. A smaller species, *A. laevicollis* Lansbr., does relatively minor leaf injury. The life history of the two first named occupies some $3\frac{1}{2}$ months comprising 9 days as an egg, $10\frac{1}{2}$ weeks as a larva and 11 to 12 days as a pupa.

179. An unidentified *Tiphia* wasp parasitises the larva but exerts only negligible control. This is the first Malayan record of a Tiphid wasp recorded from a specific host.

180. A 50 per cent. DDT wettable powder was found to be slightly superior to a mixture of DDT and lead arsenate for controlling the adults but it had to be used at 0.2 per cent. instead of 0.1 per cent. as recommended by the manufacturers. In a search for a sticker to stand up to heavy rainfall, trials were made with tapioca flour but the increase in effectiveness was only two to three days. Tests with the new polyethylene polysulphide as a sticker are in progress.

181. As a soil insecticide for killing the grubs and beetles, the best results have so far been obtained with a 6.5 per cent. gamma BHC powder at $\frac{1}{4}$ lb. in 5 gallons of water. One gallon of the mixture was applied to the soil under three trees which suffered no injury. Tests were made with soil collected after one month's exposure in the field and gave a 100 per cent. mortality of beetles in from two to three days against five to six days with DDT.

182. Two species of beetles were found to be causing injury to cacao planted next to jungle in Trengganu. A characteristic type of injury to leaves, narrow incisions cut along the leaf veins, was caused by adults of a black and white longicorn *Glenea funerula* Thoms. Shoots of Trinitario cacao showed a gummy exudation which was found to be due to boring by grubs of a species of *Alcidodes* weevil. Both of these are new records and are so far confined to Trengganu.

183. *Helopeltis theobromae* Miller causes shoot and pod injury by sucking. Application of a 0.65 per cent. gamma BHC powder by means of a petrol engine-driven duster was approximately twice as fast as a normally operated hand-duster. An experimental fogging from a Dyna-Fog machine using a 5 per cent. DDT in a special oil gave a good cover in still air.

184. *Ring borer of cacao*. Damage suspected to have been caused by caterpillars of the Hepialid moth *Phassus damor* Moore has been reported from time to time but out of 13 samples received only two larvæ were obtained and neither of these has yet become adult.

185. Recent information from correspondence with an authority in Java indicates that the insect previously referred to under the name of *Phassus damor* in that country is almost certainly some other species, and furthermore the insect in question is not considered to be a serious pest of cacao, though it is locally serious in *robusta* coffee. Reports of damage similar to that described in Java have come from only two localities in Malaya and it may well be that damage by this insect will prove to be localised here also.

(viii) CACAO DISEASES

186. A stem canker of a type not previously encountered was recorded from Trengganu. A species of *Gloeosporium* was isolated from affected tissue but the disease could not be reproduced by introducing spores of this fungus on to injured or uninjured stems of healthy cacao plants. It seems probable that the disease is initiated by insects which damage the young stems, the fungus gaining entry through the wounds and subsequently causing cankers.

187. A commonly occurring leaf disease at the Federal Experiment Station, Serdang, was investigated. Numerous small, irregular brown spots are formed on young leaves which, when attack is heavy, may be distorted. The spots do not become large but where several occur together extensive areas of the leaf can be killed. The disease is caused by a species of *Gloeosporium*, apparently distinct from the species associated with the stem canker mentioned above. The pathogenicity of the fungus was proved by introducing spores on to healthy leaves, when typical leaf spots were formed. Attack does not appear to be serious enough to warrant control measures.

188. Two cases of a stem disease in which the bark becomes dark-purple in colour and a firm brown rot spreads upwards through the wood occurred in widely separated localities. In both cases the disease was associated with a species of *Nectria*.

6.—TEA

(i) SELECTION

189. Selection of tea bushes on the basis of percentage of rooting of cuttings has not proceeded satisfactorily. Further batches of 11,250 cuttings in February and 19,000 in September were taken, making a total of over 50,000, but very few have rooted and fewer shot. Investigations are now being undertaken to improve technique for rooting cuttings by varying, in the first place, the type of cutting and the rooting medium.

(ii) TEA FERMENTATION AND COPPER STATUS

190. It is known that one of the factors affecting the quality of made tea is a polyphenol oxidase enzyme of the copper-protein type and that well known brands of Ceylon and Indian tea have a higher copper content than local tea.

191. Leaf samples from bushes growing on a sufficiently large area at the Federal Experiment Station, Serdang, to yield enough material for making tea on a fair scale have been taken regularly during a preliminary period of six months for determination of copper. This area was then sprayed with a copper solution on two occasions.

192. Samples of tea made from leaves with a lower copper content taken during the preliminary period are being compared with those made from leaves with a higher copper content plucked after the spraying to determine whether leaves with a higher copper content do make a better quality tea. The first tests indicate that this is so.

(iii) INSECT PESTS OF TEA

193. A tea estate in South Selangor reported failure with a BHC dust against the termite *Microtermes pallidus* Hav. on recently pruned bushes. After a visit it was suggested that a BHC spray should be applied on and around the bushes.

194. Less serious damage to leaves by caterpillars of the small moth *Gracilaria theivora* Wals. was checked with a DDT spray.

(iv) BLISTER BLIGHT DISEASE

195. No outbreaks of blister blight (*Exobasidium vexans*) on lowland tea were recorded during the year and it seems unlikely that the disease will cause serious damage at low altitudes.

196. Work on this disease continued throughout the year at the Federal Experiment Station, Cameron Highlands, but on a reduced scale because of shortage of staff. The following points were investigated:

- (a) The effectiveness of different fungicides. The copper fungicides Perenox (copper oxide) and Coppesan, Koneprox, Shell Copper Fungicide and Blitox (copper oxychlorides) all gave good control when applied at weekly intervals. SV Presovay (copper naphthenate) did not give adequate protection. Of four organic fungicides only one (TMTD) gave satisfactory results at the concentrations used. Copper fungicides remain the most useful type in blister blight control.
- (b) The possibility of increasing the spraying interval. Experiments in which spraying was done at intervals of 7, 10 and 14 days, using Perenox (0.25 per cent.) indicate that almost complete control is likely to be obtained only with weekly spraying, but that economically adequate results are achieved by spraying at intervals of 10 days.
- (c) The effect of varying the strength of the spray. In the past the strength of copper fungicide recommended has been 0.25 per cent. Observations and experiments made during the year indicate that half this strength could safely be used, except perhaps in periods of very heavy rainfall.
- (d) The optimum volume of spray per acre. It has been confirmed that volumes of from 10 to 20 gallons per acre are most suitable for use with pressure-retaining knapsack sprayers fitted with low-volume nozzles (the type of equipment recommended for this work).
- (e) The effect on yield of spraying tea recovering from pruning. Results so far show that yields from areas sprayed during recovery from pruning are consistently slightly lower than yields from unsprayed areas. This result is unexpected as blister blight caused severe damage on unsprayed bushes. Investigations are continuing.
- (f) The effect on yield of spraying tea in plucking. Yields from areas sprayed during plucking have been the same as yields from unsprayed areas.

7.—FIBRES

(A) *Ramie*

197. A total of nine crops has been harvested from the trial of 16 selections at Serdang and analysis of yields is under way. The results do not so far show promise. Significant differences have been found in fibre extractions of the first crop.

198. Sixteen bundles of ramie stems from a manurial trial were received for retting and preparation of fibre. The fibre was generally short and of very poor appearance.

(B) *Manila Hemp*

(i) QUALITY

199. Several samples of Manila hemp were received from two estates for assessment. These samples were generally up to standard in tensile strength but were of varying appearance and length.

(ii) DISEASES

200. A stem rot, caused by a species of *Marasmius* has been observed in Pahang and Selangor. The outer leaf sheaths of the pseudostem become brown and rotten, later drying out and becoming torn and ragged and the leaves die prematurely. In conditions of high humidity serious damage may result, plants being seriously defoliated.

201. A bacterial wilt disease of Manila hemp occurred during wet weather on a badly drained area at the Federal Experiment Station, Serdang. Bacteria from an infected plant, when inoculated into tomato plants, caused wilting with symptoms typical of ordinary tomato wilt due to *Xanthomonas solanacearum*. It thus appears that the disease in Manila hemp is caused by this organism.

202. *Helminthosporium Stem Rot*.—This stem disease, observed for the first time this year, is caused by the fungus *Helminthosporium torulosum*. Depressed, brown areas are formed on the pseudostem and the leaves die off progressively from the outside. The damage done by this disease has not been so serious as that caused by *Marasmius*.

(C) Jute and Jute Substitutes

203. A bundle of *Urena lobata* was found to be easily retted and yielded a satisfactory percentage of fibre. The fibre was not as soft but, nevertheless, could be a good substitute for jute.

204. Two samples of Rozelle fibre grown in Kelantan were received for report. One sample was white, soft and lustrous, while the other was of inferior quality.

205. *Stem Canker*.—An experimental planting of jute (*Corchorus capsularis*) was badly affected by canker, caused by species of *Colletotrichum* of the *C. capsici* group. Numerous lesions appeared on all parts of the stem. Just above soil level the fungus produced deep injuries causing infected plants to wilt and die. The same fungus, which is seed-borne, also causes damping off of seedlings.

(D) Nipah Thatch

206. There has been serious damage to attap (thatch) caused by caterpillars of the Pyralid moth *Herculia nigrivitta* Walk. The same trouble arose in 1940 in Singapore, Kuala Lumpur, Ipoh, Taiping and elsewhere, and investigations, which were interrupted by the invasion of Malaya, strongly indicated that the reason for these outbreaks was improper preparation of the attap. Nipah and sago attap are normally prepared by soaking the fresh-cut leaves in water for periods which vary from about two to six weeks, but when there is a large demand for attap this process is omitted and the attap is prepared from fresh-cut leaves, furthermore there is no selection of the leaves, any leaf of sufficient size being used whereas only mature leaves should be chosen. Soaking for one month removes 83.4 per cent. of the soluble solids including carbohydrates from the leaves and renders them unsuitable as food for caterpillars and it was largely the omission of soaking which made the attap susceptible to attack.

207. In 1940, the caterpillar principally concerned was that of the Noctuid moth *Simplicia caeneusalis* (Walker), though *Herculia* was also responsible for damage, particularly in Pahang. In the post-war outbreak, however, *Simplicia* has not been found.

208. The seriousness of the damage caused by these caterpillars can be gauged from the fact that in one instance it cost nearly £10,000 Sterling to re-roof the buildings, for which purpose attap which had not been soaked was again used, reliance being placed on the use of BHC to afford protection. The attap was again eaten.

8.—PASTURE AND FODDER CROPS

(i) CLOVER SELECTION

209. Selection plots of imported clovers have been maintained at Cameron Highlands.

(ii) PASTURE

210. An experiment to compare the yield and palatability of *Axonopus compressus* and *A. affinis*, grown with and without shade, was continued. Monthly samples were taken for analysis throughout the year. Both species from the shaded plots have recently started to have a higher crude protein content.

(iii) FODDER

211. (a) *Guinea Grass*.—Fertiliser experiments at the Federal Experiment Station, Serdang, have been continued. Monthly analyses show that the grass from plots receiving the two higher rates of application of sulphate of ammonia continues to be consistently richest in protein. Calcium determinations indicated that the heavy dressing of sulphate of ammonia did not appear to have caused any significant loss of calcium from the soil.

212. A second experiment to test the effect of applying the fertilisers at varying intervals shows that though more frequent intervals give higher yields there is no effect on the quality of the grass.

213. (b) *Napier Grass*.—In an experiment to test the yielding capacity of five strains of Napier grass and the effects of three rates of application of sulphate of ammonia on yield and quality, the yield of the plots and the quality of the grass with the heaviest dressing of fertiliser were consistently superior to those for the remaining two manurial treatments.

214. (c) *Rations*.—Renewed interest has been taken in problems connected with animal feeding, especially with poultry mashes and rations for pigs and goats.

9.—FOODCROPS

(A) *Soya Bean*

215. Final selections of Indonesian varieties have been made and 47 strains handed to the Agronomy Branch for field trials at the Federal Experiment Stations, Serdang and Kuala Lumpur, and comparison with selections of local varieties.

216. Seven bulked progenies are being maintained for further single plant selection.

(B) *Groundnut*

217. Foundation stocks of 22 groundnut strains have been maintained at the Federal Experiment Station, Kuala Lumpur, for carrying out single plant selection when the staff position improves.

218. Meanwhile preliminary data are being accumulated as the present crops are harvested.

(C) Sweet Potato

219. The collection of sweet potato varieties has been maintained but no progress made with botanical studies of it. The collection is being re-selected for strains giving a high yield of "tops" for pig feeding.

(D) Maize

220. (a) *Leaf Diseases*.—Rust (*Puccinia sorghi*) and leaf blight (*Helminthosporium turcicum*) infection were reduced by weekly spraying with Perenox (0.25 per cent.). Fairly extensive leaf scorching was caused by the spraying, which did not result in increased yields.

221. (b) *Seed Treatment*.—A field trial was carried out to discover whether seed treatment might be beneficial. It was found that neither percentage germination nor seedling growth was improved by treatment with Agrosan GN.

(E) Vegetables

(i) ONION

222. (a) *Stem Miner*.—Two stem-mining flies were identified as *Dizygomyza cepae* Hering and *Elassogaster sepsoides* (Walk.). Both were found in shallots at the Naval Base, Singapore, but only the former is serious, the latter is thought to be secondary.

223. The importance of *Dizygomyza* lies in its not having previously been reported outside Europe and its establishment in Malaya may prove serious. BHC was recommended as a spray on the plants and also as a dust raked into the soil to kill flies emerging from pupae.

(ii) CABBAGE

224. Considerable damage to cabbage at Cameron Highlands was caused by the fly *Liriomyza pusilla* (Meig).

(iii) CELERY

225. (a) *Leaf Spot*.—This disease, caused by *Septoria apiigraveolentis*, was satisfactorily controlled by weekly spraying with Perenox (0.5 per cent.) and Bordeaux mixture (4:5:40). With Perenox used at half the above strength results were not so good but weekly spraying gave an increase in yield of 106 per cent. over the control and spraying at intervals of 10 days an increase of 56 per cent. Spraying at intervals of 14 days was ineffective.

(iv) CARROT

226. (a) *Leaf Blight*.—Spraying with Perenox (0.25 per cent.) at weekly intervals gave good control of leaf blight (*Alternaria dauci*) and resulted in an increase in yield over that from unsprayed plants of nearly 40 per cent.

(v) POTATO

227. (a) *Blight*.—In an experiment using 0.5 per cent. Perenox, spraying at weekly intervals gave fairly good control but spraying at longer intervals was not satisfactory. Perenox, Shell Copper Fungicide and Bordeaux mixture were equally effective against this disease.

(vi) TOMATO

228. (a) *Bacterial Wilt*.—Soil treatment with DD soil fumigant has given promising results against this disease, caused by *Xanthomonas solanacearum*. A single treatment just before tomatoes are planted has been found useless but two treatments separated by the growing of one non-susceptible crop gives fairly good control. The fumigant is applied at 8 c.c. per sq. ft. of soil.

229. (b) *Other Diseases*.—A species of *Helminthosporium* has caused severe leaf and stem spotting on experimental plants in Kuala Lumpur. Heavy infection results in premature defoliation.

230. Other new diseases included two fruit rots caused by species of *Helminthosporium* and *Fusarium*.

(vii) FRENCH BEAN

231. Anthracnose (*Colletotrichum lindemuthianum*) was partially controlled by spraying with 0.25 per cent. Perenox or Shell Copper fungicide or with 2:2.5:40 Bordeaux mixture, the percentage of healthy pods being increased from 46 without spraying to 69 with Shell Copper Fungicide, 75 with Bordeaux mixture and 79 with Perenox. Improved control was obtained with fungicides at twice the above concentrations.

(viii) LONG BEAN

232. *Fusarium Wilt*.—A wilt of long bean (*Vigna sinensis*) in Kuala Lumpur was found to be caused by a species of *Fusarium*. Soil treatment with chloro-bromo-propene at 4 c.c. per sq. ft. reduced the incidence of the disease although control was not complete.

10.—FRUITS

(A) *Banana*

233. The variety collection is being maintained at the Federal Experiment Station, Serdang, and fruit records from this are being maintained.

234. An experiment has been laid down at the Federal Experiment Station, Serdang, to test the susceptibility of some of the commoner banana varieties to Panama disease (*Fusarium oxysporum* f. *cubense*). No plants have yet (five months after planting) shown any signs of infection.

235. A basal stem rot was found to be caused by the plurivorous fungus *Sclerotium rolfsii*, which has not previously been observed on this host.

(B) *Citrus*

236. Damage to citrus fruits at Klang, Selangor, by the caterpillar of the moth *Citripestis sagittiferella* (Moore) was rather severe. DDT spray was recommended so as to leave a toxic film on the fruit before it was bored by young caterpillars.

(i) GRAPEFRUIT

237. Investigations on the "yellowing" of grapefruit from Kedah by gas treatment showed that it must be continued for three full days for complete yellowing of the rind and that a concentration of 0.2 per cent. of acetylene would appear to be the optimum for the purpose. The untreated fruits were, however, found to be slightly sweeter than the treated ones.

11.—SPICES

(A) Cloves

238. Laboratory trials in 1951 showed that the new insecticide Dieldrin (1, 2, 3, 4, 10, 10-hexachloro—6, 7—epoxy—1, 4, 4a, 5, 6, 7, 8, 8a-octahydro—1, 4, 5, 8-dimethano naphthalene) gave considerable promise as a contact insecticide with prolonged residual effect against adults of two species of Cerambycid beetle responsible for severe damage to cloves, but it had to be used at the rather high concentration of 1.2 per cent. active ingredient in the spray emulsion. It was decided, however, that a pilot test should be carried out in the field. An area of cloves, much overgrown and more or less abandoned, but with a high incidence of borer attack, was chosen for this purpose.

239. There was only sufficient Dieldrin available at the time to spray two trees, and two other trees were sprayed with Gammalin liquid concentrate diluted to give 0.02 per cent. gamma-isomer in the working spray in the first instance, increased later to 0.5 per cent. gamma-isomer in the working spray. The reason for this increase, which was entirely empirical, was that the lower concentration did not even free the trees of ants.

240. The treatment was based on the fact that one of these beetles emerges as an adult in February/March and the other in March/April. Two sprayings were therefore carried out, one early in February and the other a month later.

241. All four sprayed trees were entirely free from fresh borer attack throughout the year, while all controls showed fresh borer attack, one of them by three borers, one by two borers and three by one borer each.

242. The name *Aphrodisium brevicorne* Franz, used for one of these clove borers in the Annual Report of the Department of Agriculture for 1950-51, page 39, paragraph 271, should be deleted. No description of this insect has yet been published and its identity is still uncertain.

12.—DERRIS

243. In an experiment at the Federal Experiment Station, Serdang, to control anthracnose, caused by *Colletotrichum derridis*, unsprayed plants made poor growth compared with plants sprayed with copper fungicides. Spraying a few times in the early stages of growth might be useful in getting the young plants established.

13.—CANDLENUT

244. Samples of candlenut were received from various localities in the Federation for the analysis of the nut and the determination of the physical and chemical constants of the kernel oil. A small quantity of cold-pressed oil has been favourably assessed by the Colonial Products Advisory Bureau, London.

14.—SOIL INVESTIGATIONS

(i) SOIL FERTILITY

245. (a) "Available" Minerals.—It was decided that the modified Neubauer test would be a suitable method for the determination of the "available" potash in soils, and a programme was drawn up to test 200 samples of soil representative of five Malayan soil types by this method.

246. During the year 192 samples of these soils have been tested using padi as the test plant. The seedlings from these tests have been analysed for "available" phosphate in addition to potash. In most cases these analyses have been carried out by both the macro and the micro methods.

247. The average amounts of "available" potash calculated on the results obtained so far are shown in the following table:

Soil Type.						Average "available" Potash K_2O p.p.m.
Quartzite	...	...	...	...	...	57.5
Granite	...	...	...	...	...	33.1
Laterite	...	...	...	...	...	36.5
Alluvial	...	...	...	...	...	113.8
Limestone and calcareous shales	...	...	...	...	...	70.9

248. (b) *Peat*.—Pot experiments were carried out with peat using maize, soya beans and tomatoes as crops. The treatments consisted of liming at three different levels, viz., 5, 10 and 20 tons per acre, N.P.K. at 8 cwt. per acre + 10 tons lime per acre + copper sulphate at 50 lbs. per acre and two treatments with 50 lbs. and 200 lbs. per acre of copper sulphate only. These experiments confirm previous findings that lime is essential for the growth of these crops on peat.

(ii) ORGANIC CARBON

249. As far as possible soil samples similar to those selected for the modified Neubauer test for "available" potash have also been employed for the determination of organic carbon. The three easier methods chosen for this investigation are the Walkley-Black titration method, the distillation method of Subrahmanyam and others and the oxidation method with hydrogen peroxide. During the year a total of 173 of these soils has been tested by the Walkley-Black method and 140 samples by the method of Subrahmanyam.

250. The results obtained from these methods will be ultimately checked against those to be obtained from the combustion method to determine the relative accuracy of each of these three methods. The distillation method of Subrahmanyam is stated to give results approximating closely to those of the combustion method, while the Walkley-Black method is claimed to give a recovery of about 70 per cent. This factor usually varies slightly from laboratory to laboratory but is said to be fairly constant for each laboratory.

(iii) SOIL SURVEYS

251. (a) *Trans-Perak*.—Since the commencement of the soil survey of the Trans-Perak padi scheme area, soil samples from approximately 50,000 acres have been examined. During the current year 120 further samples of soil were analysed. These soils were found to contain a high clay + silt fraction and would be very suitable for wet padi. The percentages of the major plant nutrients, nitrogen, phosphate and potash present were also high.

252. (b) Numerous soil samples have been examined in connection with several new experiment stations, proposed resettlement areas, water supply schemes and the development of padi areas in North Borneo, but owing to the absence of the Soils Chemist on leave other major soil survey programmes have been in abeyance.

15.—CANNING RESEARCH

(i) INSPECTION AND GRADING OF CANNED PINEAPPLE

253. All work in this connection has remained the duty and responsibility of the Canning Research Station staff during the year, and it has continued to bulk largely in the year's programme.

254. With further experience of canned pineapple grading, it was found possible to simplify and thereby clarify still further the Grading Scheme adopted during 1951. A new Scheme covering all canned pineapple products except juice was drawn up and went into use on the 15th March, 1952.

255. As a result of developments in the industry and further trials both in canneries and at the Station, modifications were introduced to two specifications. The first was a new style of "Segment" cut (or "Salad Cut") to increase the recovery of fruit as compared with the "Cube" cut, also permitting a far greater degree of mechanisation of fruit preparation. The second modification was an extension of syrup strength limits to permit the packing of "Sarawak" variety pineapple in certain grades under the Scheme.

256. The new 1952-53 Ministry of Food Contract for Canned Pineapple stipulates the inspection of certain batches, as shipped, by the Ministry of Food in London. The basis of inspection will be the grading scheme as published and modified above. To assist the Ministry in this matter, a short Information Paper (P.J.I.C. 11/52) was published. This paper sets out practical methods used at this Station for the examination of samples, so that similar methods (e.g., colour standards) may be used in London.

257. During the year 5,899 samples were drawn from canneries, and of these 3,816 were examined according to the Grading Scheme. The remainder were stored for one year and examined for "hydrogen swells" or "pinholing" before discard. Not one instance of these troubles was discovered during the year. This indicated both sound packing methods and good quality containers.

258. Detailed reports of quality are in preparation for the licensing periods. These do not coincide with the period of this report and will be published separately. Quality of products has again improved. At the year's end the industry was maintaining an average of well over 90 per cent. of batches passing grade standards.

259. Investigations were carried out in preparation of the grading scheme modifications, and considerable data have been collected on the composition of pineapple juice which will be of value in setting up standards later on.

260. Considerable advances were made in juice extraction and processing technique. More comprehensive information is now available for canners who can afford to go in for this product.

(ii) PINEAPPLE BY-PRODUCTS

261. Recovery of bran from cannery waste has been further studied and advice has been given to commercial interests investigating the possibilities of large-scale production of this commodity. The production of a "Molasses" from waste expressed juice was also carried out successfully on a laboratory scale. This is unlikely, however, to prove economically possible at the present time.

(iii) PRESERVATION BY SULPHUR DIOXIDE

262. A successful trial was carried out of sulphur dioxide preservation in barrels. This is still in progress as a storage test. Enquiries for this type of pack came from the "Hard Currency" area, and it may form a useful additional outlet for the pineapple industry.

(iv) FIELD EXPERIMENTS

263. Examination of fruit from four field trials has been carried out involving 3,889 physical and 561 chemical tests. All fruits suitable were canned and stored at 35 to 45°F for later examination and comparison.

(v) MECHANISATION OF PINEAPPLE PREPARATION

264. Small scale trials only were possible due to shortage of staff and other commitments, but sufficient data were collected to demonstrate the efficiency of machine-cutting combined with eradication methods, both on the Singapore and Sarawak pineapple varieties.

265. In consequence, considerable expansion of preparation equipment has taken place, and by the end of the year one cannery was peeling and coring all incoming pineapples by machine, both locally built and the American "Ginaca" machine.

266. Co-operation with a canner's engineering staff has resulted in the successful construction and operation of a mechanical segment cutter. Arrangements were in hand for a demonstration of this method to the whole industry early in 1953.

(vi) AIR SHIPMENT OF FRESH PINEAPPLES

267. A trial, simulating air cargo flight conditions was successfully carried out on samples of "Mauritius" pineapple with a view to air shipment to London. It is intended to do further trials when fruit with "crown" leaves become available.

(vii) CANNED PAPAYA

268. Further trials have been carried out using fruit of known variety from Serdang and Cheras Agricultural Stations in Selangor. Although insufficient specimens and varieties have been received, the indication is that the "Mexican" variety is the most suitable type for development.

(viii) ADVICE TO PACKERS

269. Four more canned fruit processing lines were installed by the end of the year, bringing the total in the industry to 17. Two pineapple juice lines were also in operation. Advice was sought and given in the erection, layout and equipment of a new pineapple cannery in Perak.

270. A demonstration was arranged for a canner of the process of chicken curry packing. This was quite successful, and assisted the canner in overcoming previous difficulties due to under-sterilization.

271. Advice was also given to a canner in difficulties with a contaminated water supply. This was cleared up by chlorination treatment. Testing methods were demonstrated, both chemical and bacteriological.

16.—PLANT PROTECTION

(i) IMPORT AND EXPORT INSPECTION

272. Sixty-eight consignments of living plant material, mostly seeds but including some cuttings and root cuttings, were inspected, fumigated, or otherwise treated, for export to other countries. Six consignments of orchids and one of roses imported by air were inspected and released.

273. Two consignments of pineapple planting material, one consisting of 1,488 suckers and slips from Australia and the other of 50 suckers from South Africa, were examined at the Isolation Nursery, Pulau Tekong. Both these consignments had been fumigated with HCN prior to shipment. The African material was clean but two of the plants from Australia had living specimens of *Pseudococcus brevipes* Ckll. on them.

(ii) NEW DISEASE RECORDS

274. The following shade trees were recorded as hosts of *Ganoderma pseudoferreum* (red root disease): *Peltophorum ferrugineum*, *Enterolobium cyclocarpum* and *Parkia roxburghi*. *Crotalaria anagyroides* was also found to be susceptible.

275. *Fomes lignosus* (white root disease) occurred on anatto in Kuala Lumpur.

276. Leaf rots caused by *Rhizoctonia solani* occurred on black gram, choy sam, four-angled bean, soya bean, snake gourd, *Borreria latifolia*, *Centrosema plumierii*, *Commelina nudiflora* and *Vigna marina*, while the same fungus caused damping off and stem rot of tomato. The perfect stage, *Corticium solani*, was found on soya bean, French bean and *Centrosema plumierii*.

(iii) REFERENCE COLLECTIONS

277. Specimens continued to be added to the phytopathological herbarium. During the year, 160 specimens were sent to the Commonwealth Mycological Institute, Kew, and 107 identifications were received. Insects sent to the Commonwealth Institute of Entomology for identification numbered 418, and 180 identifications were received. Identification of termites has been undertaken by the Commonwealth Scientific and Industrial Research Organisation at Canberra, to whom thanks are due for this co-operation.

17.—ADVISORY AND MISCELLANEOUS

278. In addition to the investigations summarised in the foregoing section a large part of the time of research officers is occupied in advisory work and *ad hoc* investigations related thereto. Among the many such points which have arisen in the past year were—the examination of samples of coastal alluvial soil in connection with the phenomenon of electrolytic corrosion of buried metallic structures; control of flies breeding in latrines and manures; termite damage to woodwork and electric cables; damage to earth bunds by Siphunculids; identification of wild and economic plants, forensic and commercial samples, chemicals,

insecticides and fungicides; establishment of a herbarium of economic plants; seed germination tests and the effect of acid on germination of leguminous cover crop seed; analyses of pond and irrigation water, sweet potato tubers, cattle food, etc.; settling tests of several DDT formulations; the effect of nutrition on hatchability of hen's eggs; the composition of cashew nut shell liquid and its production; the utilisation of padi husk; the laboratory methods of oil palm analyses; the utilisation of coconut oil sludge; *crotalaria* poisoning; the feeding value of bone and bone meal; the trace elements in peat soil; rations for pigs, goats and poultry; the vitamin requirements of poultry; the dangers attendant on the use of organophosphates; the feeding value of bagasse; tea seed oil; the possible effect of manuring on the f.f.a. of palm oil; the effect of rainfall on the development and ripening of oil palm bunches; the manufacture of vinegar from toddy; the quality of gutta percha; the processing of rubber seed; the different qualities of tapioca and sago flour; moisture content of rice and other grains; the quality of Malayan ipecacuanha root; oil palm factory technique; the essential equipment for a small chemical laboratory; the vitamins of toddy; the use of sodium chlorate as a weed killer; the utilisation of rubber seed as a feeding stuff for poultry and the preparation of fish meal and manure.

B.—AGRONOMIC INVESTIGATIONS

1.—CROPS

(A).—*Padi*

(i) WET PADI

(a) *Mechanisation*

279. Very little real progress has been achieved in the mechanised cultivation of wet padi since harvesting operations still offer the chief obstacle to complete mechanisation. As stated in last year's report further progress depends on the importation or construction of new machines and neither funds nor staff have permitted these to be carried out to any large extent.

280. It was possible to import a cheap hand-thresher and this has been well tested in Malacca, where it has shown limited promise. Hand operation was found to be much too arduous and it is planned to instal an engine.

281. A much more advanced type of padi thresher was imported by the Selangor Department and there was just time to carry out sufficient tests to plan the necessary modifications for Malayan use. More extensive trials are planned for next season.

282. These threshing trials are of considerable importance since it is planned to evolve a light header for reaping padi and there is no known means of efficiently threshing such heads except with a modern threshing machine which must also be mobile.

283. In the field of padi land cultivation, many improvements in detail have been achieved.

284. In an attempt to mechanise the weeding of wet padi by selective herbicides a pontoon-mounted power sprayer was constructed but the prototype proved unsatisfactory as it was found impossible to combine light draught and adequate rigidity. As an alternative to power spraying, light booms for attachment to modern, pressure-retaining, knapsack sprayers have now been developed but have not yet been field tested.

(b) *Fertilisers*

285. Manurial experiments have continued to give results of great promise and considerable interest. These investigations have been intensified and their execution in the field and analysis in the office have accounted for a major portion of the Department's time.

286. In the 1950-51 season 107 trials were carried out and results from 97 of these have been described and summarised (Allen. *Malayan Agric. J.* 35, 132).

287. In the 1951-52 season a fresh series of experiments were laid down which will continue for at least three seasons, and these have given some striking results which are now being prepared for publication.

288. In a series of 15 "Type and Depth of Nitrogen" experiments a top dressing of sulphate of ammonia has generally proved superior to an equivalent dressing of nitrate of soda, although placement in the soil has shown no advantage over broadcasting on the ground after withdrawal of irrigation water. At two localities in north Kedah this top dressing of 50 lbs. nitrogen per acre increased the yield of grain by 602 and 1,175 lbs. per acre respectively in the presence of soluble phosphate.

289. An unexpected experimental result from two localities was the response in yield of grain from an application of only 78 lbs. per acre of calcium in the form of gypsum, chloride or carbonate. Elsewhere neither magnesium nor calcium has produced responses in yield of grain.

290. A series of experiments designed to test the value of pre-soaking seed in strong solutions of soluble phosphates has so far given negative results.

291. Very important results have been obtained from Kedah in a type of phosphate trial where equivalent dressings of double superphosphate, rock phosphate and bat guano have been tested in the presence of adequate nitrogen. Early results indicate that, on these heavy soils, the cheap rock phosphate compares favourably with the much more expensive superphosphate, a conclusion that is at variance with experimental results from the sandier, more impoverished soils of the east coast.

292. As a direct follow-up of these experiments, 100 single extension trials have been laid down in Kedah and Province Wellesley in the 1952-53 season.

293. Results from 228 extension trials carried out in Kelantan in the 1951-52 season have already been summarised (Ashby. *Malayan Agric. J.* 35, 191). These trials showed that substantial and profitable increases in yield result from the application of one fertiliser dressing.

(ii) DRY PADJ

(a) *Mechanisation*

294. Full mechanisation of dry padi cultivation has been found to be quite practicable by conventional means at Melor in Kelantan. At this locality a McCormick-Deering 52-R Combine-Harvester has performed satisfactorily.

(b) Fertilisers

295. Results from manurial trials in the 1951-52 season were influenced by the abnormally dry season, and factorial experiments have indicated that the optimum fertiliser dressing at Melor, Kelantan, was approximately 47 lbs. per acre of nitrogen and 40 lbs. per acre of phosphoric acid. When twice these amounts were applied there was an indication that the depressing effect on yield of excess P_2O_5 was more marked than that of excess nitrogen. Potash increased straw weight without affecting yield of grain.

296. In the so-called "deficiency area", at Tanah Merah, Kelantan, crop growth showed a marked response to nitrogen, phosphorus, potassium and lime but there was no evidence of any minor element deficiency.

(B).—Oil Palm

297. The most important oil palm experiment in progress during 1952 was a replanting and fertiliser trial which was laid down at Serdang between October, 1950, and March, 1951. Height measurements on young palms indicate that under-planting, followed by delayed felling of old palms, leads to slower growth in the first two years. Nitrogen appears to be the most important nutrient in the first two years of growth on this particular soil but its effect did not attain statistical significance.

298. An unreplicated observation on the effect of planting one, two and three-year old seedlings was discontinued in January, 1952, after twelve years. In the absence of replication very little can be concluded from the yield figures but it was clear that the three-year old seedlings were slower to come into bearing than were the younger seedlings. However, even this result is suspect as the oldest seedlings were planted out in April, 1941, so the effect of war-time neglect would have been greater in this particular treatment than in the other two.

299. A large co-operative factorial manurial trial has been laid down on a Selangor estate and the first application of fertiliser was made in March-April, 1952. Nutrients tested are nitrogen, phosphorus, potassium and magnesium.

(C).—Coconut

300. Agronomic investigations have been confined to two co-operative experiments on estates in Selangor. In the first, four different intercultivation treatments have given negative results; in the second, Liberian coffee and tea are growing quite well intercultivated with old coconut palms but cacao nurseries have had a number of set-backs associated with occasional sea-water flooding.

301. Satisfactory growth of young palms has been noted in a 1951 planting at the Federal Experiment Station, Serdang, where it is planned to superimpose a manurial experiment when the palms are four years old.

(D).—Pineapple

302. Investigations on this crop have been intensified with the opening up of two new Federal Experiment Stations, both on deep peat soils, at Jalan Kebun, in Selangor, and Alor Bukit, in South Johore. A total of nine new agronomic trials was laid down during the year on manurial and cultural problems.

303. Observations on experiments now in progress suggest that increased yields can be obtained on peat soils in Malaya from the following practices:

- (a) Selection of healthy planting material followed by copper-dipping and sun curing.
- (b) Improving drainage, either by the deepening of existing drains or by ridge-planting on low lying land.
- (c) Carefully balanced manuring, with potash as the most important nutrient, which is required particularly in the later stages of growth.
- (d) Closer planting.
- (e) The use of dilute solutions of alpha-naphthalene acetic acid to induce uniform fruiting in the plant crop.
- (f) The use of copper sprays to cure the physiological die-back known in Johore as "green wilt".

304. There are indications that the variety Sarawak will become increasingly important to the Malayan canning industry as many people consider that it produces a better flavoured product than the Singapore Canning or Queen variety. Another point in its favour is that it appears to be resistant to mealy-bug wilt. A disadvantage of the Sarawak pine is the large fruit size but it is hoped to reduce this by a combination of closer planting and the use of hormones to reduce the maturation period of the plant crop.

305. Investigations on mineral soils have been confined to a paper mulching experiment on Mauritius pines at the Federal Experiment Station, Kuala Lumpur. The mulch has certainly led to improved growth but the paper has too short a life to be of any economic value.

(E).—Cacao

306. Conduct of most purely agronomic trials continues to depend on very successful co-operation with estates. Variety investigations are largely, but not entirely, confined to Agricultural Stations.

307. At the end of 1951 a total of 70 cacao experiments were in progress on estates and stations. Of this total, 25 were concluded during 1952. Reasons for conclusion of the experiments are instructive and are summarised below:

Reason for conclusion.	Number of experiments.
Communist terrorist interference ...	4
Converted to Amelonado seed garden ...	1
Land required for buildings ...	1
No further information obtainable ...	2
Failures, partial or complete ...	17

308. Of the 17 failures, two trials were under the shade of old rubber and competition proved excessive; in all other cases the failures were associated with unsuitable soil conditions or with failure to establish adequate shade for the young cacao. In one interesting case the failure to establish secondary shade of bananas was apparently caused by severe eelworm infestation of this crop. This record was new to Malaya.

309. Some of the most informative co-operative experiments are on an estate in Trengganu where treatments have been carried out with great care and precision. It is clear at this locality that healthy cacao can be grown under the shade of judiciously thinned jungle and also under the secondary forest which regenerates after felling old jungle without a burn. Growth of Amelonado cacao under jungle shade at this locality has been described as "comparable with if not better than that obtained on good soils of the Gold Coast".

310. When cacao is grown with cultivated shade it is considered to be essential that this shade should be well established before cacao seedlings are planted out in the field. No one type of shade tree is suited to all conditions and a mixture of several species is considered ideal. All the following species have been found to be of value :

Erythrina subumbrans
E. suberosa (in north Kedah)
Gliricidia sepium
Indigofera Teysmanni
Parkia javanica
P. Speciosa
Albizzia falcata
 Selected Bananas

Another tree of potential value is a sterile hybrid of *Leucaena glauca* which has not yet been adequately tested.

311. The shade tree *Albizzia falcata* is easy to establish and grows rapidly but it cannot be recommended with confidence because of its liability to attack by root disease and also because old trees suffer from frequent branch-break.

312. On no estate has bananas proved to be really successful and they can only be recommended in mixed shade or for small-holders' use.

313. Excellent cacao growth continues to be recorded at three localities on well drained alluvial clays.

314. The Amelonado seed garden at Serdang has shown much improved growth in 1952 as a result of better shade conditions. It is now clear that the major pests are likely to be the *Helopeltis* bug and arboreal mammals such as monkeys, squirrels and tree-rats.

(F).—Tea

315. A nitrogenous manuring experiment on tea at Serdang was concluded in April after running for four years. Experimental yields during the fourth year were as follows:

N ₂ PK ...	...	1,803 lbs. per acre made tea
N ₁ PK ...	...	1,541 . " "
N ₀ PK ...	...	1,219 " "

The annual applications of nitrogen were 600, 400 and 0 lbs. per acre of sulphate of ammonia respectively. These nitrogen dressings were clearly economic and it is probable that even higher rates of application would be beneficial.

316. Rooting trials at both Serdang and Cameron Highlands have continued throughout the year in co-operation with the Research Branch. Some of these trials have given disappointing results and improvements in technique are now being studied.

317. Towards the end of the year a start was made in planting out a multiplication area of Serdang clones.

(G).—*Coffee*

318. A co-operative experiment on an estate in north Selangor was laid down during the year in which Liberian coffee was one of three crops to be planted under the shade of old, tall coconuts. Growth of this coffee has been very satisfactory and the Liberian variety is still the only one that can be confidently recommended for cultivation in Malaya.

319. A shade and variety trial is still in progress at Serdang with the following varieties under test:

Liberian
Uganda
Kawisari
Kalimas

Yields remain low on this Kedah series soil but the two hybrid coffees show promise of improved performance under better conditions. Unfortunately their yield has been limited to a large extent by the fact that graft-wood was taken, in error, almost entirely from lateral branches and most scions have thus grown only in a horizontal plane.

320. Coffee will be given more attention when conditions permit the opening up of a Federal experiment station on volcanic soils.

(H).—*Fibres*

(i) MANILA HEMP

321. In a Manila hemp variety trial at Serdang, on what is now known to be unsuitable soil, the varieties Tangongon and Serdang C have given the best performance during the year with the following yields:

	Yield of stems (lbs. per acre)	Calculated yield of Fibre at 2% (lbs. per acre)	Average height.
Tangongon ...	43,380	868	6' 8"
Serdang C ...	61,390	1,228	6' 6"

322. Crops are beginning to respond to a regular fertiliser programme which commenced in 1951 and the average heights of these varieties were 7 ft. 5 in. and 7 ft. 4 in., respectively, at the end of the year.

323. Non-experimental crops of Tangongon and Bangunanon have grown very well on well-drained alluvium at Degong in Perak, and satisfactory crops are now being obtained by certain estates. Variety trials have been planted at Sungei Ruan, in Pahang, and Sungei Burong, in Selangor, during the year and arrangements are being made to plant a trial at Degong.

324. Two co-operative trials of Manila hemp intercultivated with young rubber are in progress on estates in Johore and Selangor. On the first estate, establishment has been excellent in spite of pig damage, but growth in height has been disappointing

and it is apparent that fertilisers are required on this soil. On the other estate, establishment has been patchy and damage from wild pig severe. The soil, however, is satisfactory with adequate drainage.

(ii) RAMIE

325. Two ramie variety trials of locally selected material are in progress but yields have been somewhat disappointing. A third trial has recently been planted on an alluvial muck but establishment has been poor. It is clear that this crop merits only limited attention and all investigations with it on peat have been discontinued.

(iii) JUTE

326. Jute trials have continued on alluvial muck soils at Sungei Burong, Selangor, and it is apparent that only *Corchorus capsularis* var. *Segama* merits attention amongst the varieties and species so far tested. A somewhat gappy crop of this variety yielded 814 lbs. per acre of good quality dry fibre and a very similar yield was obtained from a subsequent manurial trial, although applications of nitrogen increased the yield of fibre. Unfortunately a seed crop of Segama jute, which grew very well on mineral soil in Kuala Lumpur, suffered from severe eelworm attack after flowering and seed is still in short supply.

(iv) OTHER FIBRES

327. Other fibre crops have received only limited attention but planting material is maintained at Serdang of a wide range of fibre plants. One local selection of *Urena lobata* has given a good quality fibre but it requires to be sown very thickly on rich soil to prevent early branching.

(I).—Fruits

(i) BANANA

328. Harvest has commenced in a factorial manurial trial at Ampang Tinggi, in Negri Sembilan, but it is too soon to look for treatment differences. A second similar trial has recently been laid down at Ayer Hitam Agricultural Station, Johore.

(ii) OTHER FRUITS

329. The Mexican variety of Hawaiian papaya has yielded fruit of excellent quality which has been shown to can well. The fruit is large and well-flavoured but the variety appears to require very good conditions of growth.

330. Italian limes have yielded very well in Kuala Lumpur when manured with a potash-rich fertiliser mixture. Ripe fruit can be sold locally as lemons at a price of 25 to 30 cents each. In the past, this variety has been unpopular as the unusually large fruit size has encouraged Asian growers to harvest the crop when much too unripe.

331. A rambutan variety trial at Serdang gave a third harvest in July and the best yielding clones were R. 4, R. 5, R. 12, R. 7 and R. 11. Clone R. 61 has still not yet fruited.

332. In a strawberry paper mulch and variety trial at Cameron Highlands, Cambridge 448 has shown the best growth to-date.



MANILA HEMP

Variety trial at the Degong Agricultural Station, Perak.

JUTE

A manurial trial at Sungei Burong Agricultural Station, Selangor, with the Segama variety introduced by the Department in 1952.





BAMBI

The first Bali calf to be born in Malaya. The Department of Agriculture introduced breeding stock of *Bos sondaicus* from Bali in 1951.



Singapore Canning pineapples growing on deep peat in South Johore. The even fruiting is the result of spraying with a dilute solution of alpha-naphthalene acetic acid.

333. Planting material of the Chinese gooseberry, *Actinidia chinensis*, has been imported from New Zealand and a few seedlings are growing at Cameron Highlands but they show very little vigour and it appears unlikely that this crop will become acclimatized.

334. A large fertiliser trial has been superimposed on a 1947 planting of King Oranges at Degong Agricultural Station with a view to determining the effect of different fertilisers on yield and fruit quality.

(J).—Fodder Grasses

335. Seven field trials have been in progress throughout the year at Serdang and one of these has been duplicated at Bukit Mertajam Agricultural Station in Province Wellesley. These investigations are long-term and treatments studied include different methods of intercultivation, of irrigation, of manuring and varietal differences.

336. Napier and Guatemala grasses usually out-yield Guinea grass but the latter is very palatable and easy to manage. On Serdang soils heavy nitrogen and potash dressings are beneficial but there is little evidence that phosphate is required in quantity. Many frequent applications of fertiliser do little to increase the gross yield of dry matter but help to even out peak yields and to maintain a high protein content. Frequent irrigation is of limited value under Serdang conditions where yields vary more with fertiliser treatment.

337. A deficiency of potash is shown by a conspicuous reddening of leaf tips and edges; this is aggravated by high nitrogen dressings.

338. Molasses grass has been found to yield viable seed in season but it is somewhat too hairy to be palatable.

(K).—Leguminous Fodders, Green Manures and Cover Crops

339. *Stylosanthes gracilis* continues to show promise as a fodder and cover crop in Kelantan and elsewhere, especially on sandy soils. However, it is now clear that regular manuring is required and a factorial fertiliser trial was laid down at Bachok, Kelantan, during the year.

340. *Aeschynomene americana* has grown well in Kedah and it seeds profusely. It is a good goat fodder and has also shown some promise as a green manure for padi fields.

341. *Sesbania speciosa* continues to be a promising green manure for padi fields and trials have been extended during the year. For dry land, the quick-growing *Indigofera Teysmanni* has proved to be a most useful green manure crop which also seeds quite reliably.

342. Other new cover crops of interest are:

Indigofera dosua var. *tomentosa*

Eupatorium riparium (non-leguminous)

Desmodium scorpiurus

Mimosa invisa var. *inermis*

(L).—Pastures

343. A large factorial manurial trial has been in progress at Serdang since November, 1951. Yield figures have not yet been examined statistically but it appears that nitrogen is the most important nutrient.

344. In a shade and variety trial on old mined land, *Axonopus affinis* continues to outyield *A. compressus* but the growth of the shade has been very slow and has still not yet had a significant effect on yield.

(M).—*Vegetables and Foodcrops*

345. A series of vegetable variety trials has been carried out, both on the plains and at Cameron Highlands, with a view to locating alternative sources of seed if supplies of Chinese seed should ever become curtailed. These investigations have met with some success and it has been shown that Japanese varieties of *Brassica chinensis* can replace Chinese varieties, both on the plains and on the hills. Similarly an Indian variety of "Lobak", *Raphanus sativus* var. *hortensis*, has outyielded all Chinese and Australian varieties. It has also been shown that good seed of the flowering Choy Sam, a variety of *Brassica rapa*, can be raised locally, although this may cost more than imported seed.

346. A long-term manurial investigation was commenced at Cameron Highlands in September in an attempt to devise an acceptable system of cultivation which is not associated with fly breeding. The manurial treatments consist of:

- A. 5 tons prawn dust per acre per year.
- B. 3 tons Sterameal Black Label+inorganic fertiliser.
- C. 3 tons ground bean cakes+inorganic fertiliser.

The annual rotation is made up of repeated crops of cabbage, beetroot and French beans. From the first crop of the first cycle highest yields were obtained from treatment C, with treatment A second. The obvious manurial dressing would be compost with inorganics but such a system has not found favour with Chinese growers.

347. In maize variety trials at Kuala Lumpur, imported Salisbury White open-crossed and hybrid seed has given outstanding yields. Open-crossed progenies are now being raised in order to determine if these yields can be maintained in Malaya.

348. Yates Imperial 847 lettuce has given excellent yields in Kuala Lumpur and its quality is high. This is the standard variety at Cameron Highlands. A Mauritius strain of Mignonette lettuce has been selected and it has been found that seed can be produced locally. This variety does well in wet weather.

349. Much of the work at the Federal Experiment Station, Kuala Lumpur, has consisted of testing strains of soya beans received from the Botanical Division. This work has proceeded satisfactorily and the standard of cultivation and pest control has been high. Foundation stocks of groundnut selections have also been maintained.

(N).—*Derris*

350. Towards the end of the year it was decided to re-commence work on the selection of clones from *Derris elliptica* var. *Changi* No. 3 as it had then been pronounced free from serious disease when growing under good conditions. Individual plants are being line-propagated and roots submitted to the Senior Chemist for analysis. This programme will be complete by the end of 1953, by which time a preliminary selection of clones will be possible for field trials.

351. Planting material of *D. elliptica* var. *Sarawak Creeping* has been maintained at Serdang but little interest has been shown in this crop.

(O).—*Miscellaneous Crops*

352. Growth of Conophor nut at Serdang has now become a little disappointing although a few fruits have been produced. In north Kedah growth has been somewhat more vigorous but, although the lianes have flowered, no fruit has been set.

353. In the *Strophanthus* collection maintained in Kuala Lumpur, *S. jackianus* continues to fruit regularly and *S. gratus*, *S. hispidus* and *S. sarmentosus* have all flowered profusely. The last two have produced a few fruit. Interest in this genus appears to be waning.

2.—LIVESTOCK

(A).—*Goats*

354. A breeding herd of British Alpine, Toggenburg, Saanan and Anglo Nubian goats has been maintained at Serdang during the year and distribution of young males to the Field Branch has commenced on a small scale. In general, British Alpines give the best milk yield but it is still too soon to decide which breed yields the best meat from half-bred animals.

355. All half-bred bucks are being castrated and sent to Bukit Mertajam where a long-term feeding trial is in progress. The first animal to be slaughtered reached a live-weight of 80 lbs. in twelve months and carcase quality was reported to be good. This investigation will continue until it is possible to select the best dual-purpose breed for Malaya.

356. Quarterly average milk yields from the best pure-bred does have ranged up to one gallon a day.

(B).—*Pigs*

357. During the year seven Middle White boars and six gilts were imported from the United Kingdom, partly for extension and partly for investigation. Half-bred animals from these boars will be used in feeding trials.

358. A feeding trial has been in progress throughout the year at Cameron Highlands with a view to testing the value of a proprietary feeding supplement in counteracting the post-weaning check. This is a cumulative trial with weaner-replications added as they become available. Results to date have been inconclusive.

359. Three imported boars fell sick of suspected erysipelas at Serdang shortly after arrival but later recovered after treatment by the Veterinary Department. This illness has delayed the commencement of another feeding trial designed to test the value of feeding a proprietary supplement containing aureomycin and vitamin B. 12.

(C).—*Poultry*

360. A two-year investigation on feeding and management of Rhode Island Red and kampong birds has been in progress at six localities and will shortly be complete. Results have not yet been analysed.

361. A series of feeding trials on Perak stations has given useful information on the high order of experimental errors which are associated with such investigations in the tropics.

362. In a series of duck investigations on agricultural stations in Selangor it has been shown that the local drake x imported duck cross is more productive than the reciprocal. Investigations with Pekins and Khaki Campbells continue but the Aylesbury breed is now considered unsuitable and has been discarded.

(D).—Cattle

363. A breeding herd of Bali cattle is being built up at Serdang as this breed is considered to be of great potential value to both arable and plantation agriculture in Malaya. During the year five calves have been born of which one died shortly after birth. The synonymy of this species is given below:

Bos banteng Wagner (1844)

Bos sondaicus Schlegel and Muller (1845)

Bos banting Sundeval (1846)

C.—EXTENSION AND ADVISORY WORK

1.—CROPS

(A).—Rubber

364. The new organisation set up to plan and encourage the replanting of smallholders' rubber has been described elsewhere in this report. The response to the interim scheme, that came into operation in September, 1952, justifies the hope that the new scheme may herald a change in attitude to the problem of replanting among smallholders. The size of the problem can be judged from the estimates of the smallholders' Enquiry Committee that out of the 1,400,000 acres of smallholding rubber 900,000 are due or overdue for replanting and 338,000 acres should be replanted in the next ten years.

365. The actual acreage of replantings in 1952, compared with previous years, shows no marked change in the general trend, and it is apparent that the interim scheme came too late to affect materially the amount of replantings in 1952. The following table gives the total acreage of replantings and new plantings as reported by the Rubber Instructors of the Rubber Research Institute for the past three years, and below is given the actual distribution of improved planting material for the past three years:

	Replantings (acres)			New Plantings (acres)		
1950		3,499	...		3,581	
1951		3,778	...		5,588	
1952		4,250	...		6,725	
	1950		1951		1952	
Budwood (yards) ...	37,176	...	39,489	...	46,936	
Clonal seedlings ...	1,123,279	...	1,575,797	...	1,535,715	
Germinated seed ...	192,518	...	1,131,093	...	400,000	

366. The Colonial Development and Welfare Scheme No. 1176 again provided funds for the scheme of technical assistance under which groups of kampong youths are given an elementary course in the principles of rubber planting and factory techniques at the Rubber Research Institute station at Sungei Buloh. Two five-month courses were held and they were attended by a total of 69 young men.

367. Pending the appointment of State Replanting Officers and subordinate staff the administration of the interim Rubber Replanting Scheme was the responsibility of District and Land Officers with the onus for field inspection of applications falling largely upon the staff of the Department. A greatly increased interest in replanting is indicated by the volume of applications received for the first part of the subsidy which covered felling and preparation for planting. In respect of approved applications the area to be replanted totalled 7,084 acres. A great many, however, could not be inspected in the time allotted for the interim scheme and they will be dealt with under the main scheme; others were rejected because the terms were not always understood and the required work had not been fully carried out.

368. The large scale replanting of smallholders' rubber that is now contemplated offers a challenge both to those who lead the industry and to the smallholders themselves. Experience has shown that the smallholder cannot be easily persuaded to replant. His is a serious problem. The realists appreciate that the small acreage they planted or inherited must someday be replanted or replaced, but the loss of a steady income is a matter of great immediate concern. The replantings will take seven years to come into production and in the interim period need time and money spent on them. Seven years is a long time to wait even for the prospects of an increased income of two to three times that based on present values. The memories of past price fluctuations may well induce a chary attitude.

369. Given the general quality of Malayan soils, and the favourable climate, rubber must continue to be the firm favourite among the possible cash crops. The Department has advocated a policy of greater diversification and the Replanting Scheme allows the use of cess funds for replanting old rubber lands with another crop. The decision has also been made to advocate, under suitable soil conditions, the hedge-row planting of rubber and intercropping with other crops. The substitution of other crops for rubber is an opportunity to put right obvious cases of bad land utilisation, as exemplified by changing from rubber to padi, coconuts or oil palms on coastal clays. Hedge-row planting and intercropping offer a very wide range of cropping systems depending on soil conditions, the more obvious and practical being fruit trees, coffee, pineapples, annual crops and perhaps fodders for stock. The most important immediate benefit of the system is that it should compensate the smallholder for the loss of rubber income. The Department accepts responsibility for advising on (a) the suitability of the land for rubber or for some other crop in substitution for rubber (b) crops to interplant in hedge-row planted rubber, and (c) maintenance of soil fertility.

370. The importance of raising the quality of smallholder processed rubber exercised the attention of field officers of both the Rubber Research Institute and the Department and encouragement was given to schemes fostering the sale of latex, as latex, for bulk processing either by co-operative societies formed from the smallholders themselves or by large commercial concerns. Greatest progress was reported in Johore, Selangor and Kedah, but although only approximately 2 per cent. of the total output from smallholdings was handled it still meant, in Kedah, that 1,451,177 lbs. of rubber with a nett value of \$1,230,115 to the smallholders was classed as first grade in place of fourth or fifth if individual processing had been done.

(B).—Padi

371. The three main lines of investigation on which extension work can be based are (i) improved varieties and strains, (ii) manuring and (iii) cultivation. Work has continued in the padi experiment stations on varietal trials and ear to row selection work on proved varieties. Nearly all the pre-war work was lost, and the first results of the post-war work are now being applied. In Malacca, pure strain padi was planted in 90 extension plots of 1/40 acre each on selected cultivators own land. In South Krian and Pahang, proved varieties have also been given out to selected cultivators.

372. In addition, standard varieties, some of which are under selection, are kept in production in seed farms, and when a demand exists these are distributed to growers. During the year 36,000 gantangs were distributed.

373. Reference was made last year to a series of padi manurial trials on smallholders' land in Kelantan, during the 1951-52 padi season. The results of these trials have been published (Ashby. *Malayan Agric. J.*, 35, 191). The success obtained in these trials was such as to warrant the immediate commencement of a campaign to give the findings the widest publicity. The Federal Government decided to grant a subsidy amounting to 50 per cent. of the cost of the manure, and arrangements were made with a commercial firm for the supply of the specified manure. Two supply depots were opened and a local delivery service was provided by the Rural and Industrial Development Authority.

374. After a slow start, demand for manure built up rapidly until distributions were brought to an end by monsoon rain in late November, by which time 221 tons had been issued. At the recommended rate of 200 lbs. per acre, 2,480 acres were manured. It is reported that great enthusiasm has been raised and it seems likely that six to eight times this area may be manured next year.

(C).—Planting Material, excluding Rubber

375. During 1952, 16,870 budded fruit trees were sold or distributed. Plots of budwood nurseries of selected clones of rambutans and durians are maintained at all agricultural stations and these two varieties constitute the bulk of the plants sold. The mango is the only other budded fruit tree sold in quantity and demand is mainly confined to the padi areas of Perak. The papaya might be considered a household garden tree and its ease of propagation presents no great establishment problems, consequently it is popular in new development areas and new villages. In Kedah, the Department embarked on a programme of supplying 10,000 seedlings to new villages.

376. Interest in pepper growing was catered for by the production of rooted cuttings. From one station alone, in Pahang, 5,000 cuttings were distributed.

(D).—Amelonado Cacao Seed Gardens

377. Investigation work has progressed so favourably as to warrant initiating a policy to meet smallholders' probable demands for seed. This took the form of establishing one or more small Amelonado seed gardens in each State. By the end of 1952 some 15 acres of seed gardens throughout Malaya had been successfully established with extension work in progress.

2.—MECHANICAL CULTIVATION

378. In last year's report mention was made of the cultivation trials in Kelantan which had shown that deep mechanical cultivation gave substantial increases in yield over ox ploughing on dry padi lands. Increases up to 100 per cent. had been obtained. This led to a Rural and Industrial Development Authority pilot scheme for hiring tractors to cultivators. The response has been disappointing, only 200 acres were ploughed last season.

379. The most progress is being made in Perak where it has been successfully demonstrated that many of the padi areas can be ploughed and harrowed by mechanical means. The Rural and Industrial Development Authority has sponsored schemes throughout Perak and in addition there are now fifteen privately owned tractors plying for hire among smallholders.

380. It seems evident that, at our present stage of development, padi alone cannot provide an economic basis for mechanisation. Preliminary cultivation which is quite practicable over very wide areas must be crowded into too short a period and provides too few working days. Moreover, the bottleneck in production, if land is available, is not so much the area a family can cultivate and plant, but the area a family can harvest, and this latter problem in mechanisation is proving most difficult. Other work must be found for the tractors.

381. The Rural and Industrial Development Authority scheme in Selangor for the Tanjong Karang padi area has made some progress and six more tractors have been purchased, making a total of ten. Here the scheme was mainly based on the particularly favourable conditions of land and climate for off-season cultivation in the coastal padi belt. In Perak more varied work is being obtained for the tractors; it has been found on dry land crops, and in the opening of already cleared land for rubber plantings and intercropping with bananas and dry padi. In the main extension padi areas of the north-east and north-west diversification is likely to be more difficult, and Perak is fortunate in that there is a great deal more scope in that State for general farming. Time is not necessarily important to a smallholder, relief from the toil of land preparation will appeal to him on the grounds that either he can afford it from his other cash resources, or he is released for other remunerative work.

382. Tractors have been provided for work in the new villages and so far their use has been almost exclusively confined to opening up new land that is free from stumps and which is usually under sheet lalang. The first cultivation by hand of such land can cost up to \$250 per acre. It remains to be seen whether mechanisation will fit into Chinese farming. A typical 2 to 3 acre holding is a mosaic of different crops in small patches at all stages of growth. To make effective use of even the most manoeuvrable tractor, with the all essential mounted equipment, the layout and the cropping system will need to be planned for mechanisation.

3.—LIVESTOCK

(A).—Pigs

383. There has been no change in policy; the Middle White is still the chosen medium for upgrading the local Chinese pig. During the year 278 head of breeding stock was sold from the Department's farms.

384. Most pig rearers are still unwilling to breed pure-bred Middle Whites, and the demand is therefore for the use of stud boars. In Malacca the Department's stud farm boars performed 213 services and sired 2,300 piglings. Privately owned boars performed 29 services.

385. Stud centres have been established in many new villages in most States and Settlements, the boars being provided by the Department and the housing from funds specially provided for aid to these villages; in consequence the distribution of Middle White blood has been greatly increased during the past year. In Penang it has been reported that the cross bred carcase brings a premium of up to \$5 per picul.

386. During the year, new blood was imported from the United Kingdom. Seven boars and six in-pig gilts were purchased, they all arrived safely.

(B).—Poultry

387. During 1952, 3,490 head of poultry and 9,900 hatching eggs were sold, a large increase over 1951 when the figures were 1,602 and 5,236 respectively.

388. The Rhode Island Red is still the favourite breed and for the past three years the State Department in Selangor has imported new blood from the United Kingdom. Other breeds are also being tried in Selangor and importations from good flocks in the United Kingdom were made for the purpose. Trials are in progress but no evidence has so far emerged that will upset the popularity of the Rhode Island Red. As with pigs, the first cross with the local breeds is the most popular, and, except for the few who keep pure breeds on a commercial scale or as a hobby, there is still little evidence that the small farmer is prepared to invest heavily in pure bred stock.

389. The State Department in Selangor has also conducted trials with Pekin, Khaki Campbell and Aylesbury ducks, the stock being imported from the United Kingdom. The breeds have been compared and also their crosses with the local ducks; the Pekins and Khaki Campbells have done well enough to justify further trials but the Aylesbury breed has been discarded. Both the egg production and the fertility rates of the Aylesbury ducks were very low.

(C).—Fishponds

390. The ready adaptability of the imported *Tilapia Mossambica* to Malayan conditions and its agreeableness to local palates have helped considerably towards the success of a joint campaign by the Fisheries Department, Rural and Industrial Development Authority and the Department of Agriculture to encourage the breeding of this fish in inland areas where protein deficient diets are to be expected. Demonstration ponds have been established in several States at agricultural stations, new villages and in selected *kampongs*.

4.—PESTS

391. Rats, bandicoots, squirrels, monkeys and wild pigs are all pests of importance, and the natural condition of forest and swamp in Malaya make control measures most difficult. Under the leadership of the field staff, farmers are encouraged and assisted in the campaign that is continuously waged. If cacao eventually becomes an economic crop in Malaya stern measures will be necessary against the squirrel.

392. Some data, which are only a rough indication of the magnitude of the problem, are kept by Kedah, Perlis, and Malacca, on poison baits laid, and the pests found poisoned or otherwise destroyed. Kedah and Perlis laid 773,000 poison baits for rats, out of which 500,000 were taken. Dead rats and bandicoots totalling 184,000 were counted. Records in those areas also show that 21,000 squirrels, 3,000 monkeys and 3,600 wild pigs were destroyed.

5.—NEW VILLAGES

393. The State and Settlement Agricultural Officers have taken an active part in the development of the agricultural new villages. The Member for Agriculture and Forestry controls a fund that can be used for agricultural projects in such villages. State and Settlement Agricultural Officers can often secure prompt assistance for schemes that they sponsor. The schemes cover a wide range of types of assistance to secure orderly development of the farm areas and alleviate some of the unavoidable difficulties inherent in the opening of new farms and homesteads. They include stud boar centres, drainage, fencing against pests, tractors and equipment for opening new lands, and small demonstration and extension stations for pigs, poultry, ducks, fruit trees and field experiments.

6.—GENERAL AGRICULTURAL EDUCATION

394. Since the war there has been a growing desire for more and more forms of education, including agricultural, and endeavours to meet the demands locally have expressed themselves in various ways.

(A).—Courses at Agricultural Stations

395. At agricultural stations in three States, Johore, Selangor and Kedah, courses in crop and animal husbandry and agricultural machinery, ranging from a few days to several months in duration, have been held for local farmers including, on occasion, their families as well. The purely academic aspect was not emphasised; instead the aim was to demonstrate that successful farming was a way of life, not a job! Special one week courses for school children were also arranged in Selangor on three occasions.

(B).—Civics Courses

396. These catered essentially for people from new villages, were usually part of a week-long general Civics Course in which all Government Departments participated and, without exception, took the form of a "Field-day" at local agricultural stations. Attendance at each course was generally limited to thirty people and because of the limitation in time no attempt at education in the true sense of the word was possible. Rather was the object to show how the Department could assist farmers, to demonstrate particular agricultural services, and to explain how a farmer could make contact with the Department when in need.

(C).—“*Budding*” Courses at School Gardens

397. Malaya being a tree-crop country a knowledge of budgrafting technique of fruit and rubber if not essential, is at least highly desirable. School boys in rural areas were successfully taught the technique using demonstration and practice beds of both fruit and rubber seedlings established at 33 schools in Kedah.

(D).—*Agricultural and Padi Shows*

398. On each occasion when a State or District Agricultural Show was held the opportunity was taken to erect Departmental stalls for the graphic display of the work of the Department, in all its phases, to the public. Padi Shows staged under the auspices of the Department were held in Kedah at *mukim* level.

(E).—*Agricultural Newsletter*

399. For the first time, a quarterly Newsletter, compiled by the Department of Agriculture, Kedah, and catering exclusively for Kedah farmers was issued in 1952 with the object of forging an even closer link between the farming community and the Department. It was printed in Jawi, in non-scientific language, was free, and had a circulation of 6,000 copies.

D.—AGRICULTURAL EDUCATION

400. Each year the Government offers 15 Diploma Scholarships. In 1950 and 1951 there were only five and four new holders of these scholarships. In 1952 it was decided to lower the scholarship academic qualification to include boys with Grade III School Certificate provided they were considered to have the personality and background which would fit them for a career in agriculture.

401. Twelve candidates, which included six Malays, were selected for scholarship. In addition three Diploma Scholarships were awarded to outstanding agricultural subordinates already in the service of the Department. Five scholarships were awarded by the Rubber Research Institute and four by the Rural and Industrial Development Authority. There was one private student. There was, thus, a total of 25 students in 1952 taking the first of the three-year Diploma Course.

402. Shortage of teaching staff made it impossible to hold the one-year minor course during 1952. This shortage became acute when three Malay members of the staff proceeded overseas for further training.

1.—ADVISORY COUNCIL

403. There were no changes in the membership of the Advisory Council. The Council met twice during the year on 8th February and on 9th July.

2.—COLLEGE YEAR

404. The year was divided into three terms, as under :

3rd term, 1951/52, session—10th January to 9th April.

1st term, 1952/53, session—10th June to 29th August.

2nd term, 1952/53, session—29th September to 18th December.

3.—REGISTER OF STUDENTS

405. The categories of students in training were composed as follows :

Register of Students, June, 1952

Category.	Malays.	Indians.	Chinese.	Others.	Total.
DIPLOMA COURSE.					
THIRD YEAR STUDENTS.					
Federal Scholars	1	—	4	—	5
Private Students, Federal ..	—	—	2	—	2
	1	—	6	—	7
SECOND YEAR STUDENTS.					
Federal Scholars	1	—	2	—	3
Agricultural Subordinate Major Scholars	3	—	1	—	4
Rubber Research Institute Student in training	1	—	—	—	1
Assistant Rural Development Officers in training	6	—	—	—	6*
	11	—	3	—	14
FIRST YEAR STUDENTS.					
Federal Scholars	6	3	3	—	12
Agricultural Subordinate Major Scholars	3	—	—	—	3
Rubber Research Institute Students in training	2	—	3	—	5
Assistant Rural Development Officers in training	3	1	—	—	4†
Singapore Scholar	—	—	1	—	1
	14	4	7	—	25
GRAND TOTAL ..	26	4	16	—	46

* One admitted as from 2nd term, 1952/53, session. This student completed his first year of training in 1947/48, but had to leave the College owing to illness.

† Admitted as from the 2nd term, 1952/53, session.

406. Of the above, one Federal Scholar (Chinese) of the third year Diploma Course died on 1st November at the General Hospital, Kuala Lumpur, as a result of illness.

4.—TRAINING

407. The training in the Diploma Course followed the same general lines as before. Practical field work was carried out on the adjacent Federal Experiment Station, with the active co-operation of the officers staffing the Station. This is continuing to provide a valuable part of the training.

408. With the courtesy and assistance of the Rubber Research Institute a party of senior students was accommodated at Sungei Buloh Experiment Station from 9th to 16th November, where an intensive course was given in the more specialised and advanced phases of work on rubber, as a culmination to the present stage of the work already performed at the College. Visits were paid to nearby holdings, to the Centralised Processing Factory at Gombak and to the laboratories at Headquarters, Rubber Research Institute.

409. A party of selected senior students assisted with a survey of pineapple areas in the Kuala Langat District from 17th to 23rd November. Three principal areas were surveyed, i.e., Sejangkang, 139.5 acres, with 43 occupiers, Batu 10 (Telok Panglima Garang), 766 acres, with 175 occupiers, Jenjarom (Tanjong 12), 441 acres, with 111 occupiers.

410. Instructional visits were arranged to as many places as possible, and included—

Headquarters laboratories, etc., Kuala Lumpur.

Cheras Agricultural Station.

Padi areas and places of agricultural interest in Perak, Penang and Province Wellesley, and Kedah.

Industrial areas in Klang and Kuala Langat districts of Selangor.

5.—HEALTH AND RECREATION

411. With the exception of the student who died in hospital, the health of the students and labour force was good.

412. The emergency and curfew have severely restricted many previous recreational pursuits. However, with the permission of the Officer-in-Charge, Police District, Sungei Besi, it was possible to arrange for a bus to take in a party of students to Kuala Lumpur in the evenings once a week.

6.—CATERING

413. This has remained a staff responsibility. Tinned foodstuffs were obtained from the Malayan Wholesale Co-operative Society Ltd., Kuala Lumpur, at prices cheaper than obtainable elsewhere. Supplies of fresh foodstuffs were obtained from the neighbouring Serdang Bharu Village.

7.—ALUMNI ASSOCIATION OF THE COLLEGE OF AGRICULTURE

414. This is very active and is growing in importance. The membership figures were as follows :

REGISTER OF OLD BOYS

By Occupational Status

	Minor Course Students.	Diploma Course Students.	Total.
Department of Agriculture ..	131*	86†	217
Other Government Departments ..	44	32	76
Rubber Research Institute ..	3	56	59
Penghulus/Assistant Penghulus ..	81	—	81
Salaried Employees, Estates ..	3	22	25
Salaried Employees, Commercial ..	4	20	24
Private Enterprise, Agricultural ..	33	6	39
Private Enterprise, Non-agricultural	3	5	8
Total Employed ..	302	227	529
Total Died ..	8	10	18
Total Untraced ..	60	28	88
GRAND TOTAL ..	370	265	635

By Nationality

	Malays.	Chinese.	Indians.	Others.	Total.
Diploma Course ..	103	126	27	9	265
Minor Course ..	352	12	—	6	370
Total ..	455	138	27	15	635

* Includes 3 in North Borneo, 12 in Brunei, and 3 in Sarawak.

† Includes 2 in North Borneo, 3 in Brunei, and 10 in Sarawak.

8.—GENERAL

415. Training courses for Ketuas Kampong from 20th April to 31st May, and for kampong women from 6th to 14th September, were conducted at the College on behalf of the Rural and Industrial Development Authority.

E.—PUBLICATIONS AND LIBRARY

1.—PUBLICATIONS

416. The principal publications of the Department are *The Malayan Agricultural Journal*; Special Bulletins (General, Scientific, Economic, and Mechanisation Series); three vernacular agricultural journals, i.e., *Warta Perusaha-an Tanah*, *Ma Loy Chow Nung Nyip Tsung Poh* and *The Tamil Agricultural Journal*; and Agricultural Leaflets.

417. On the creation of the post of Publications Officer on the 1st January, 1952, the Agricultural Economist ceased to be Editor of Departmental publications. The Publications Officer, who is the Editor of *The Malayan Agricultural Journal* and also of the three vernacular journals, has the advice and guidance of the Publications Committee of the Department, of which he is a member and the Secretary, and of the Sub-Committee for Vernacular Publications of which he is Chairman.

418. Due to various difficulties, no issues of the vernacular publications were published in 1952.

419. Publication of the *Malayan Agricultural Journal* was continued quarterly and the delay in issuing the Journal, mentioned in the last Report, was substantially reduced.

420. A reprinted edition of the Planting Manual "An Outline of Malayan Agriculture" was issued in March; an Agricultural Leaflet "Fermentation and Drying of Cacao Beans" was issued in April; and the Special Bulletin (Mechanisation Series) "Investigations into the Mechanical Cultivation of Padi in Malaya, August, 1950" was issued in July.

421. The following is a summary of all publications of the Department printed in 1952, together with the number of copies sold or issued free :

English.	Sales.	Free and Exchange.	Total.
MALAYAN AGRICULTURAL JOURNAL—			
Vol. 34, No. 4	472	832	1,304
Vol. 35, No. 1	426	809	1,235
Vol. 35, No. 2	423	864	1,287
Vol. 35, No. 3	428	835	1,263
Vol. 35, No. 4	430	841	1,271
			6,360
LEAFLETS (<i>Printed</i>)—			
1. Fermentation and Drying of Cacao Beans :			
Agricultural Leaflet No. 30	—	356	356
SPECIAL BULLETINS (<i>Printed</i>)—			
1. Investigations into the Mechanical Cultivation of Padi in Malaya, August, 1950 :			
Mechanisation Series No. 1	90	710	800
MALAYAN PLANTING MANUAL NO. 2 (<i>Reprinted</i>)—			
1. An Outline of Malayan Agriculture	452	100	552

422. The following summary shows the number of back numbers of the various publications of the Department distributed during 1952 :

	Sales.	Free and Exchange.	Total.
Malayan Agricultural Journal ..	631	221	852
Special Bulletins	240	75	315
Agricultural Leaflets	17	1,390	1,407
Poultry Leaflets	1	96	97
Grow More Food and Educational Series	6	541	547
Malay Agricultural Journal	—	109	109
Leaflets in Malay	—	2,056	2,056
Chinese Agricultural Journal	—	115	115
Leaflets in Chinese	—	—	—
Tamil Agricultural Journal	—	—	—
Leaflets in Tamil	—	—	—
			5,498

423. The following is a summary of all publications sold and distributed during the year :

	Sales.	Free and Exchange.	Total.
English	3,792	7,494	11,286
Malay	—	2,165	2,165
Chinese	—	115	115
Tamil	—	—	—
	3,792	9,774	13,566

424. Comparative figures for total revenue received during 1951 and 1952 from the sale of publications and from advertisements are as follows :

	1951.	1952.
	\$ c.	\$ c.
Sale of publications ..	4,191 03	7,118 56
Advertisements ..	2,032 00	1,804 00
	6,223 03	8,922 56

2.—LIBRARY

425. The Library contains about 3,400 books and reports published in book form and nearly 28,100 bound volumes of periodicals. There are approximately 1,050 unbound volumes of periodicals which are of earlier years and incomplete. Approximately 1,350 periodicals are available.

426. Over 150 periodicals and all annual reports are circulated to members of the staff as they are received.

F.—SCHEMES SPONSORED UNDER THE COLONIAL DEVELOPMENT AND WELFARE ACT (U.K.)

427. Brief particulars are given here of development schemes in progress under the control of the Department of Agriculture, Federation of Malaya. All these Colonial Development and Welfare Schemes are scheduled to be completed by the end of 1953.

428. *Schemes D. 698, 698A, 698B and 698C.*—These schemes were for the purpose of appointing an Adviser to the Malayan Pineapple Industry for the immediate administration of the rehabilitation, re-organization and development of the Industry. The grants approved under these schemes were £1,320 (\$11,314.27), £5,600 (\$48,000), and £500 (\$4,285.71) respectively to meet the salaries, office expenses and passages of the Adviser, appointed at first for one year from the 20th December, 1946, then extended to two years and further extended to cover his period of leave up to the 30th April, 1950.

429. It was considered necessary to retain the services of the Adviser for a further period of three years and the Central Board of Pineapple Packers, Malaya, agreed to contribute half the expenses for this period, the other half to be met from Colonial Development and Welfare Funds. This Scheme terminated on the 19th December, 1952. Thereafter the development of the Malayan Pineapple Industry will be administered by funds obtained from the Pineapple Industry Cess Fund.

430. *Scheme D. 669.*—A grant of £38,000 (\$325,714) was made in June, 1946, for conducting experiments on the mechanisation of wet padi cultivation in Malaya.

431. The grant was specifically for meeting capital expenditure on machinery, to meet expenses in connection with the appointment of an agricultural mechanisation expert for about two years and the cost of publication of the results of mechanisation experiments in Malaya. This Scheme was due for completion on 31st December, 1951, but was extended to 31st December, 1952, in view of liabilities outstanding on the Crown Agents for the Colonies for equipment ordered but not received. The Scheme is now completed.

432. *Scheme D. 1176.*—A grant of £121,786 (\$1,043,875) was approved for a scheme for the provision of improved rubber planting material to smallholders and for the training of selected youths from the rural areas in all aspects of rubber cultivation to form a nucleus of instructed individuals to return to their villages after training. The scheme was designed to cover a period of five years and is administered with the co-operation of the Rubber Research Institute of Malaya. From the inception of the scheme in August, 1949, to the end of 1952 the following quantities of material were distributed to smallholders throughout Malaya: 123,601 yards of rubber budwood, 4,234,790 clonal seedling stumps and 1,723,466 germinated seeds.

433. Courses in budding and other techniques connected with the cultivation and processing of rubber were instituted at the Rubber Research Institute Experiment Station, Sungei Buloh, for selected trainees from rural areas. Expenditure from August, 1949, to December, 1952, was \$965,241.16 and revenue for the same period is estimated at \$262,000.00.

434. *Scheme D. 1220.*—A grant of £10,500 (\$89,930) was approved for the establishment and maintenance, for a five-year period, of an Isolation Nursery for cacao at Pulau Tekong, Singapore. This Station is intended to serve the phytosanitary needs of British South East Asian territories by the preliminary quarantine of their imports of selected planting material. Since this station was opened planting material of cacao has been received, planted, raised and distributed to Pan-Malayan and other territories. In 1952 consignments of selected planting material of

crops other than cacao have been received from other countries for quarantine prior to its introduction into the Federation. Expenditure incurred on this scheme since its inception to December, 1952, was \$58,189.05.

SECTION V

AGRICULTURAL LEGISLATION

435. Legislation, as briefly summarised below, was passed during 1952.

1.—THE CUSTOMS PROCLAMATION (B.M.A. No. 30)

Prohibition of Exports Order, 1952

436. An order came into force on the 1st July, 1952, prohibiting the exportation of canned pineapple from the Federation except in accordance with the provisions of the Pineapple Industry (Cess on Exports) Regulations, 1952.

437. Legal Notification 373 of 1st July, 1952, refers.

2.—THE PINEAPPLE INDUSTRY ORDINANCE, 1951

The Pineapple Industry (Cess on Exports) Regulations, 1952

438. These Regulations prescribe the manner in which the cess on the Pineapple Industry shall be paid, and the imposition of the rates of cess on Pineapple exports.

439. Legal Notifications 374 and 375 of the 1st July, 1952, refer.

3.—THE PINEAPPLE INDUSTRY REGULATIONS, 1952

440. The Regulations prescribe the form of registration of a pineapple cannery and the conditions attached thereto.

441. Legal Notification 376 of the 1st July, 1952, refers.

4.—THE RUBBER INDUSTRY (REPLANTING) FUND ORDINANCE, 1952

442. An Ordinance designed to provide for the collection of a cess on the production and export of rubber, for the establishment of a fund into which money collected as cess is to be paid and for the constitution of a Board to administer the Fund.

443. An Order stipulating the rate of cess on all rubber produced in Penang and all rubber exported from the Federation other than Penang.

444. Legal Notification 482 dated the 20th August, 1952, refers.

445. A scheme for the replanting of smallholders' rubber whereby interim provision is made for the granting of advances for replanting during 1952 to smallholders.

446. Legal Notification 487 of the 28th August, 1952, refers.

447. A second scheme for the administration of Fund "B" for the replanting of smallholders' rubber designed to aim at a target of replanting 500,000 acres of smallholders rubber by the 31st December, 1959.

448. Legal Notification 633 of the 15th November, 1952, refers.

O. J. VOELCKER,
*Director of Agriculture,
Federation of Malaya.*

APPENDIX I COMPARATIVE ACREAGES OF AGRICULTURAL CROPS

	1947 Acres.	1948 Acres.	1949 Acres.	1950 Acres.	1951 Acres.	1952 Acres.
Rubber	3,317,299	3,362,525	3,364,460	3,358,251	3,535,221	3,612,820
Oil Palm	78,181	83,320	90,507	93,331	97,933	100,182
Coconut	512,086	510,824	499,610	509,289	509,306	485,260
Padi (Rice)	813,550	885,484	908,070	930,530	875,390	831,050
Total	4,721,116	4,842,153	4,862,647	4,891,401	5,017,850	5,029,312
FOODCROPS :						
Tapioca	41,807	41,693	41,341	35,461	27,411	23,428
Sweet Potato	20,363	21,619	18,922	17,091	10,843	13,449
Sago	6,556	6,693	6,738	6,224	6,467	6,364
Sugar Cane	4,541	3,297	2,346	1,989	2,055	1,861
Groundnut	2,300	1,556	1,027	1,755	1,943	2,479
Maize	1,107	1,117	806	2,583	2,997	7,332
Yam	870	836	621	1,107	1,077	1,101
Colocasia	3,627	3,711	3,354	2,802	3,072	3,390
Ragi	451	72	37	*	39	25
Soya Bean	145	186	63	*	106	117
Pulses	487	854	548	*	784	1,569
Vegetable (Market Gardens)	15,019	15,205	13,167	10,844	10,671	12,640
Total Foodcrops	97,273	96,839	88,970	79,946†	67,465	73,755
FRUITS :						
Pineapple	11,920	16,082	17,239	23,981	24,468	24,843
Banana	64,075	59,950	57,629	48,150	39,988	40,257
Cashew Nut	1,512	2,219	2,049	2,207	2,102	2,120
Specified Fruits	20,430	25,288	32,914	66,547	*	*
Mixed Fruits	82,997	85,348	77,264	34,940	*	*
Durian	*	*	*	*	25,270	26,652
Rambutan	*	*	*	*	14,779	15,848
Mangosteen	*	*	*	*	7,342	8,025
Citrus Fruits	*	*	*	*	2,064	2,312
Other Mixed Fruits	*	*	*	*	41,823	41,909
Other Fruits under Sole Crop	*	*	*	*	2,925	2,210
Total Fruits	180,934	188,887	187,095	175,825	160,761	164,176
SPICES						
Areca nut	50,983	50,194	48,957	48,391	47,659	44,862
Chillies	3,189	3,159	2,490	2,291	2,212	3,258
Pepper	80	75	80	148	156	204
Cardamom	8	7	5	2	1	—
Ginger	1,358	1,562	1,447	1,238	976	1,013
Sireh	2,308	2,418	2,438	2,768	2,729	2,900
Nutmeg	53	87	70	77	80	69
Cloves	289	288	293	283	226	195
Turneric	1,085	1,174	1,120	889	838	731
Total Spices	59,353	58,964	56,900	56,087	54,877	53,222
MISCELLANEOUS :						
Tea	9,732	9,516	9,413	8,434	8,497	9,561
Coffee	8,958	7,047	9,507	8,951	7,435	9,299
Cacao	*	*	*	*	531	295
Tobacco	4,266	1,294	1,457	408†	2,109	3,830
Derris	772	234	297	571	428	244
Nipah	32,074	27,238	33,438	33,559	33,472	33,749
Gambier	518	387	532	986	831	932
Kapok	1,852	1,814	1,770	1,720	1,567	1,411
Ipeacacuanha	678	678	257	219	179	250
Patchouli	501	109	32	37	16	8
Citronella	88	33	20	12	19	27
Gutta Percha	5,635	5,635	5,635	3,471	5,635	5,635
Other Miscellaneous	645	508	753	657	1,213	1,437
Total Miscellaneous	65,719	54,493	63,111	59,025	61,932	66,678
TOTAL ALL CROPS	5,124,395	5,241,336	5,258,723	5,262,284	5,362,885	5,387,143

* Not available.

† Incomplete.

APPENDIX II

DEPARTMENT OF AGRICULTURE, FEDERATION
OF MALAYA

STAFF LIST AS AT 31-12-52

Director of Agriculture : O. J. Voelcker, C.B.E., M.A., A.I.C.T.A.
Deputy Director of Agriculture : R. G. Heath, B.Sc. (Agr.), A.I.C.T.A.
Administrative Officer, Headquarters : H. F. Logan.
Office Assistant : Dhian Singh.
Financial Assistant : Lim Chooi Leong.

RESEARCH BRANCH.

Chief Research Officer :
 (Vacant).

L. N. H. Larter, B.Sc. (Hons.), A.R.C.S.,
 A.I.C.T.A. (Acting).

(I) BOTANY.

Senior Botanist :

R. B. Jagoe, B.Sc. (Hons.)
 (On Leave).

E. A. Rosenquist, M.A., Dip. Agr. Sci.
 (Camb.) (Acting).

Botanists :

L. N. H. Larter, B.Sc. (Hons.), A.R.C.S.,
 A.I.C.T.A.

E. A. Rosenquist, M.A., Dip. Agr. Sci.
 (Camb.).

F. B. Brown, B.Sc., Dip. Agr. Sci. (Camb.).

Miss R. A. Upton, B.Sc. (Hons.) (Temp.).

One Vacancy.

Assistant Research Officer :

Tak bin Haji Daud.

(II) CHEMISTRY.

Senior Chemist :

(Vacant).

Gunn Lay Teik, O.B.E., M.A. (Cantab.)
 (Acting).

Chemists :

Gunn Lay Teik, O.B.E., M.A. (Cantab.)

Miss M. T. O'Halloran, B.Sc. (Temp.)

Assistant Chemist :

K. Kanapathy, B.Sc. (Hons.) (Annamalai
 University).

(III) ENTOMOLOGY.

Senior Entomologist :

H. T. Pagden, M.A., F.R.E.S.

Entomologist :

R. J. A. W. Lever, B.Sc. (Hons.) (Dunelm),
 D.I.C. (Lond.), A.I.C.T.A., F.L.S.

Assistant Research Officer :

Kamardin bin Bahar.

(IV) PLANT PATHOLOGY.

Senior Plant Pathologist :

(Vacant).

A. Johnston, B.Sc. (Hons.), A.I.C.T.A.,
 A.L.S. (Acting).

Plant Pathologist :

A. Johnston, B.Sc. (Hons.), A.I.C.T.A.,
 A.L.S.

(V) SOILS AND PLANT PHYSIOLOGY.

Senior Soils Chemist :

(Vacant).

Gunn Lay Teik, O.B.E., M.A. (Cantab.)
 (Acting).

Soils Chemists :

J. K. Coulter, B.Sc., B.Agr., Dip. Agr. Sci.

(Camb.), A.R.I.C. (On Leave).

A. R. McWalter, B.Sc. (Hons.)

Two Vacancies.

Assistant Research Officer :

Haji Abdul Wahid bin H. Jaffar.

(VI) CANNING RESEARCH.

Canning Officer :

A. E. Billington, M.A., A.R.I.C.

FIELD BRANCH.

Chief Field Officer :

J. R. Curry, Dip. Agr. Sci. (Dunelm), N.D.A.

Agricultural Economist :

(Vacant).

J. R. Curry, Dip. Agr. Sci. (Dunelm), N.D.A.
 (Acting).

Personal Assistant to Chief Field Officer :

(Vacant).

C. Ratnam, Temporary Assistant.

KEDAH—*State Agricultural Officer (Kedah and
 Perlis)*

J. Cook, B.Sc. (Hons.), A.I.C.T.A.

Agricultural Officer :

P. G. Coleman, B.A., A.I.C.T.A.

Assistant Agricultural Officers :

Mohd. Salleh bin Musa.

Salim bin Mohd. Akib.

KELANTAN—*State Agricultural Officer* :

H. K. Ashby, B.A. (Hons.), Dip. Agr. Sci.,
 A.I.C.T.A.

Assistant Agricultural Officer :

Mahmud bin Haji Yaacob.

TRENGGANU—*State Agricultural Officer* :

H. K. Ashby, B.A. (Hons.), Dip. Agr. Sci.,
 A.I.C.T.A. (Acting).

Assistant Agricultural Officer :

Jaafar bin Mampak.

PENANG AND PROVINCE WELLESLEY—
Settlement Agricultural Officer :

J. R. Milburn, B.Sc. (Dunelm), D.T.A.
 (Trin.).

Assistant Agricultural Officer :

Min bin Haji Ahmad.

APPENDIX II—(cont.)

FIELD BRANCH—(cont.)

PERAK—*State Agricultural Officer* :
H. J. Simpson, B.Sc. (Agr.), Dip. Agri. (Wye).

Agricultural Officers :

Perak North—(Vacant).

Ismail bin Haji Md. Salleh, A.A.O. (*Acting*).

Perak South :

T. R. Dickinson, B.Sc. (Agr.) D.T.A. (Trin.)

Perak Central—(Vacant).

Ramly bin Haji Tahir, A.A.O. (*Acting*).

Assistant Agricultural Officers :

Ramly bin Haji Tahir.

Ismail bin Haji Mohd. Salleh.

SELANGOR—*State Agricultural Officer :*

E. J. H. Berwick, M.A., Dip. Agr. Sci. (Camb.), A.I.C.T.A.

Assistant Agricultural Officer :

Zakaria bin Abdul Rauf.

PAHANG—*State Agricultural Officer :*

P. A. Gething, M.A., Dip. Agr. Sci. (Camb.), A.I.C.T.A. (*Acting*).

Assistant Agricultural Officers :

Pahang East—

Wan Abdul Aziz bin Ungku Haji Abdullah.

Pahang North—

Othman bin Mohd. Lela.

Pahang South—

Ahmad bin Jamal.

Cameron Highlands—Agricultural Officer : (Vacant).

N. Kanagaratnam, Agricultural Development Officer-in-Charge.

NEGRI SEMBILAN—*State Agricultural Officer :*

G. S. Keeping, B.Sc., Dip. Agr. Sci. (Camb.).

MALACCA—*Settlement Agricultural Officer :*

J. Chattaway, B.Sc.

JOHORE—*State Agricultural Officer :*

W. N. Scott, B.Sc., B. Agr., Ph.D., D.I.C.

Agricultural Officers :

Johore North—(Vacant)

Hj. Abd. Rahman bin Mahmood, P.I.S., A.A.O. (*Acting*).

Johore Central—

P. Class, B.Sc. (Agr.), D.T.A. (Trin.)

Assistant Agricultural Officer :

Haji Abdul Rahman bin Mahmood, P.I.S.

ON LEAVE :

Agricultural Officers :

H. M. James, M.C., Dip. Agr. (I.C.T.A.)

A. L. Barcroft, B.Sc.

H. D. Matheson, B.Sc., D.T.A. (Trin.)

AGRONOMY BRANCH.

Senior Agronomist :

E. F. Allen, B.A., Dip. Agr. Sci. (Camb.), A.I.C.T.A.

Agronomists :

R. Henderson, M.C., B.Sc.

J. L. B. Hitchcock, B.Sc. (Dunelm).

J. S. Ure, B.Sc. (Agr.), D.T.A. (Trin.)

Six Vacancies.

Agricultural Engineers :

D. W. M. Haynes, B.Sc. (*On leave*).

One Vacancy.

Agricultural Officers (Livestock and Poultry).

Two Vacancies.

Statistician :

I. Watson, B.Sc. (Hons.)

Assistant Statistician :

Lee Yoke Heng.

Agricultural Development Officers :

J. A. Cox, A.M.I.B.A.E., Kedah.

E.W. Bewlay, Serdang.

A. Cumming, Serdang.

N. Kanagaratnam, Cameron Highlands.

AGRICULTURAL EDUCATION BRANCH.

Principal, College of Agriculture, Malaya :

O. M. Lee, A.I. Mech. E., A.I.N.A., F.L.S.

Senior Lecturers :

Mrs. M. H. Lee, B.Sc. (Hons.) (*Temp.*)

Mrs. M. Henderson, B.Sc. (Hons.), Dip. Agr. Sci. (Cantab.) (*Temp.*)

Registrar and Bursar :

Yap Chin Hee.

Assistant Lecturers :

Mohd. Rashid bin Ahmad.

G. R. Kurup, B.A. (Madras).

PUBLICATIONS BRANCH.

Publications Officer :

J. J. Holmes.

Librarian :

P. J. Verghese.

PUBLIC GARDENS.

Horticultural Officer, Penang :

H. Ritchings (*On leave*).



